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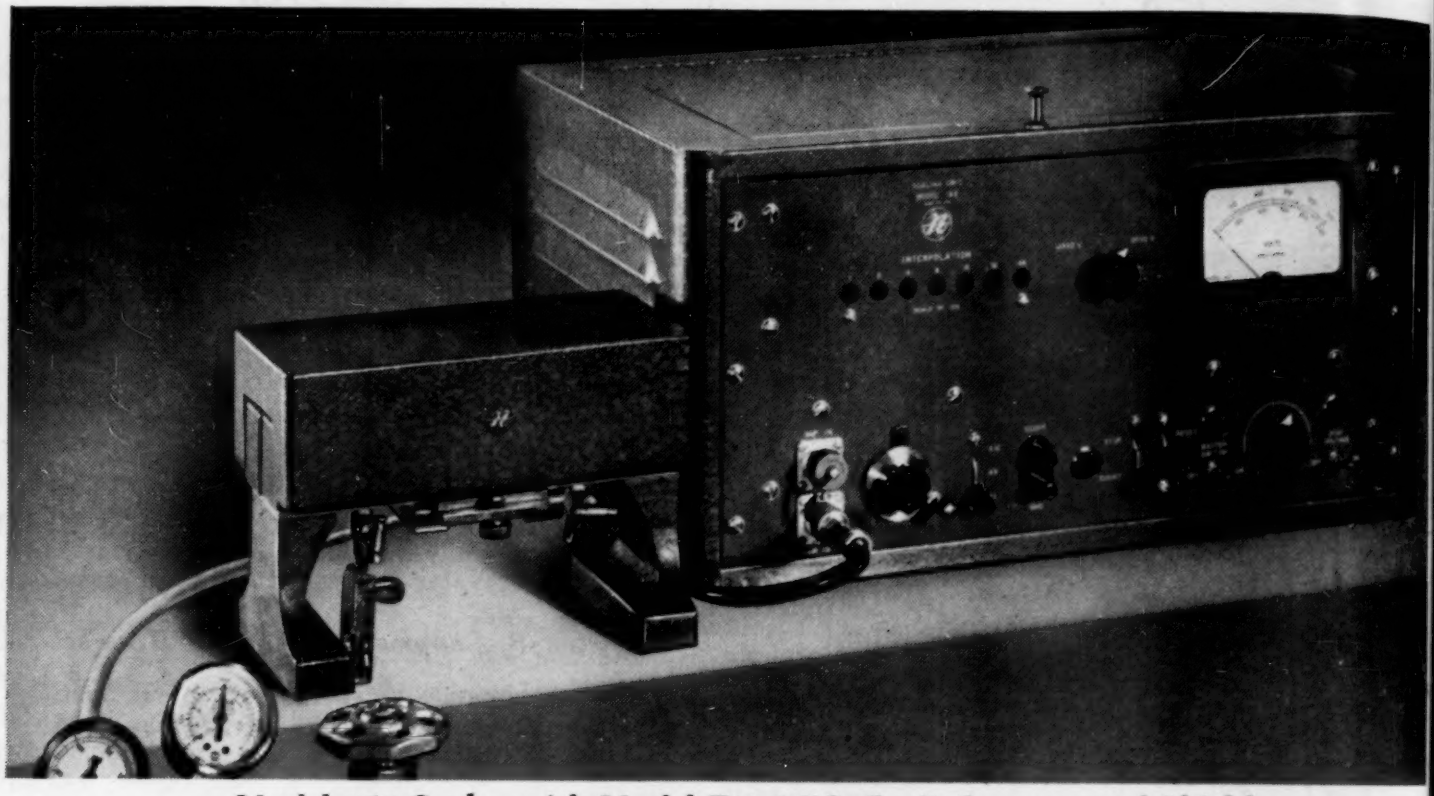

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Research and Politics

Richard B. Goldschmidt
University of California, Berkeley

RESEARCH, AT LEAST IN THE SCIENCES, proceeded in the 19th century more or less apart from the nation's life. If the laboratories were not exactly ivory towers, they were at least sheltered oases, far from the noise of the market place. In the European nations scientists particularly were considered a pleasant and honored asset to the community, were respected, sometimes a little ridiculed, but generally left alone. Their discoveries were accepted, sometimes admired, and, if of practical importance, taken over and used by the applied sciences. Nobody asked a scientist why he attacked a special problem. Nobody asked him what practical good could come out of his results. It was accepted as a truism that the exploration of nature, the search for laws beneath the phenomena of nature, grew from a natural longing of the human mind and represented a goal in itself which did not need further justification. This appraisal of science had a corollary, namely, that science, being solely bent upon the discovery of truth, must be free from outside interference by society and the state, although of course governed by law. When Imperial Germany, a reactionary monarchy, led by the dyed-in-the-wool Junker, Count Bismarck, adopted a new constitution in 1871, a paragraph of this constitution read: "Science and its teachings are free." There were indeed very few instances in the European countries of the 19th century—that is, in the period in which the basis of modern science was laid—of interference with the freedom of science by governments, however reactionary, though there have always been organized groups of different colors who clamored for such interference. This was true even where the universities were completely controlled by government and the professors were civil servants. It happened, to take an example, that under the rule of the Catholic Centrist party in Bavaria, professors were denounced in the Diet for teaching evolution. But they were not prevented from continuing to do so, since even the worst reactionaries did not go so far as to abolish the freedom of teaching.

In our country, conditions were somewhat different. The Constitution does guarantee the freedom of speech, but science and its teaching are not mentioned. There are no federal universities. In endowed universities, only public opinion can prevent the trustees from setting up rules infringing upon the freedom of science. In state universities the regents, the governors, and the assemblies may, if public opinion permits, strangle the freedom of science and its teaching. Everybody knows that such things have happened. There are still states in which the teaching of evolution is forbidden. There are events happening from time to time in this or that university which force the watchdogs of liberty to boycott the offending school. But greatly to the credit of our democracy, these are rare exceptions and as a whole science and its teaching have remained free.

Does this mean that no future danger exists and that we may as well forget the problem of freedom of science? Twenty years ago such complacency would not have been too harmful. But since then the situation has been completely changed. First, we have seen the rise of dictatorships (and unfortunately thus far only two have fallen)—dictatorships which attempt to control not only the minds of their subjects but also to control what science is permitted to do and to think. Do not say this cannot happen here. It *will* not happen, I trust, but it *can* happen. Second, the applications of science to the industrial field and consequently to national defense have reached a level at which restrictions to science in some fields cannot in the general interest be avoided. This creates the problem of how to take unavoidable measures of caution without infringing upon the basic freedom of science. Third, even in the oldest and most solidly founded democracies an economy has developed which is dependent upon and interlaced with the economies of the entire world. Disappearance of distances has begun to work against traditional individualism and in favor of stronger centralization of power. Whether we like it or not, the trend everywhere is away from individualism and uncontrolled economy toward collectivism. Whether we like it or not, this tendency is bound to increase. Stronger central power means centralized control of the purse strings. This increases the danger of political control of how the money is spent. Where there are federal or state allotments to science, the control will certainly not be in the hands of the scientists. Fourth, events in science have taken place which lead more and more to the introduction of organized teamwork in research. The step from there to planned control and then control by the politicians of science is a very small one indeed. I propose to discuss mainly the first and the last of the four developments I have enumerated.

The experience of science in dictatorships is of greater significance to us than we might think. Even if there is no danger in the near future that similar tragic developments could happen here, it is instructive and important to see the pattern from which such things form and develop. You all know how the Nazis abused the science of genetics to further their criminal racial doctrines and how they made anthropology and eugenics, ethnology, and prehistory and even history in Germany a perversion and abomination. But these are things of the past—are they really?—and therefore I prefer to put in the foreground what is happening today in Soviet biology.

The whole story, part of which I had an opportunity to witness, is very remarkable.

Up to the end of the first World War genetics was practically nonexistent in Russia, though Russian biology was on a very high level. It was H. J. Muller who brought the first *Drosophila* stocks to USSR. Calvin F. Bridges soon afterwards served as a professor of genetics in Leningrad. Russian biologists took to the new science with enthusiasm and soon centers of research sprang up in which excellent work was done. In fundamental genetics it was first the zoologist, my late friend Philipchenko, who organized a fine group center in animal and plant genetics and did important work himself. The second great center developed in Moscow where Russia's leading zoologist of that time, the great scholar, observer, experimentalist, and thinker, N. K. Koltzoff (one of my oldest friends), realized the overwhelming importance of the new science and organized genetical and cytological departments in his laboratory of experimental biology. These leaders were followed by a host of excellent men and one has only to look at the volumes of the *Biological Journal* and other Soviet periodicals of the time between 1920 and 1930 to witness the brilliant upsurge of genetical and cytogenetical work in USSR. Parallel with this development went an enthusiastic realization of the importance of genetics for plant and animal breeding. Here the recognized leader was Vavilov. Though originally trained as a geneticist, he never did any outstanding work in fundamental genetics. His interest was in the application of genetical work to plant breeding. Thus, he devoted all his explosive energy to the building of an organization of modern experimental stations all over the country in which genetical and cytogenetical methods were used for the improvement of crop plants. When I visited his laboratory in 1929, he had a staff of about 2,000 employees, and the government furnished ample means for his work. His own line of thought, which earned for him leadership in his field, led to the recognition of the genic reserve available in old cultural varieties and their surviving ancestors. In a continual series of collecting expeditions he searched for such forms and brought them home to test their usefulness. This was work of a long view, and it might have led to important practical results had it been continued long enough. How much in the way of practical results it did achieve is probably known only to the agronomic specialist.

I had the pleasure of seeing all this development of genetics near its height in Russia. At Leningrad in 1929 an all-Russian genetics congress was held at which three guests of honor from abroad were present: Erwin Baur, the plant geneticist, Harry Federley, the cytogeneticist, and myself. All of us, none sympathetic to the political regime in USSR, were unanimous in praising what we saw at this congress. There were innumerable papers and lively discussions. There were huge plenary sessions, with Vavilov and Philipchenko presiding, at which Soviet politicians of the highest rank praised the work of the Russian geneticists. There was a scientific enthusiasm among the old leaders as well as among the brilliant young scientists such as none of the three guests had ever witnessed before. There was an exhibition of genetical specimens and charts which was admirable, quantitatively and qualitatively. Fundamental geneticists at that time were discussing most heatedly Serebrovsky's ideas, and applied geneticists, discussing their wheat-breeding experiments, were equally represented in the very large gathering. Inside and outside the lecture halls the meeting proceeded smoothly and in a most friendly atmosphere.

This does not mean that the political leaders of the USSR did not watch our science. Actually, I was told that studies in human inheritance were fraught with danger. One leading biologist, who in his search for the hereditary basis of genius studied the pedigree of Russia's most beloved poet, Pushkin, had mentioned correctly that the poet hailed from a family of petty nobility. This biologist got into trouble with the authorities. By chance, I saw a little more of the official attitude. One day, walking along the street with my friend Philipchenko, I saw in front of a movie house a large poster of "Salamandra" decorated with pictures of this harmless animal. My surprised question was answered by my friend with an invitation to see the film. This we did, and my friend interpreted the text. To understand the implications of this propaganda film, which was featured all over Russia, we must turn back to European biology in the first decade after the rediscovery of Mendel's laws.

The Lamarckian doctrine of the inheritance of acquired characters had been completely dropped by most biologists since the time of Weismann's piercing analysis. It had hardly any adherents, except in France, where the doctrine lingered on for a long time, and in the science of paleontology. The rise of genetics, the factual basis of which is irreconcilable with the tenets of Lamarckism, had given the coup de grâce to this doctrine.

In the first decade of the century, a young Viennese zoologist, a brilliant speaker, and clever, popular writer, Kammerer, stirred European biology with a long and voluminous series of papers in which he claimed to have found proof for the inheritance of acquired characters. Two sets of his experiments were especially exciting. In one he compared the black viviparous alpine salamander (newt) with the black-and yellow-spotted oviparous salamander of the lowlands. He claimed that by breeding the black one on yellow background and the spotted one on dark background he could transform appearance as well as reproduction from one type to the other. The new induced type was claimed to be hereditary, even to Mendelize if crossed to the original form. The second experiment was done with the midwife toad, the male of which seizes the egg strings laid by the female, winds them around his hindlegs, and carries them about until hatching time. An exception to the rule, this male is devoid of the thick pigmented thumb pads which other frog and toad males need for the standard type of copulation. Kammerer claimed that he could change the mating habits of the midwife toad to those of ordinary toads by breeding them under conditions used for other toads. Such males not only stopped "midwifery" but also developed the thumb pad and, again, this new induced character was said to be inherited and to Mendelize if crossed to the original form.

In the discussion of these claims, statements were found in Kammerer's papers which did not tally. There had not been sufficient time, according to his own records, for the generations he claimed to have bred. The explosion came when an American visitor, Noble, looked at the specimens exhibited in Kammerer's institute and found that the "induced" dark thumb pad was injected with India ink. Soon after this Kammerer, who was said to have become completely despondent, accepted an invitation to live in USSR. Nothing was heard of what he did there except that, soon after, he committed suicide.

Very likely there are few men left who knew Kammerer and who had seen his work in Vienna under his own guidance, so I should like to give you my interpretation of this much-discussed tragedy. I do not believe that Kammerer was an intentional forger. He was a very highstrung, decadent but brilliant man who spent his nights, after a day in the laboratory, composing symphonies. He was originally not a scientist, but what the Germans call an "Aquarianer," an amateur breeder of lower vertebrates. In this field he had an immense skill, and I believe that the data he presented upon the direct action of the environment are largely correct. (Some of them were actually anticipated a long time before in Weismann's laboratory by M. von Chauvin, who made the experiments for just the opposite reason.) He then conceived the idea that he could prove the inheritance of acquired characters and became so obsessed with this idea that he "improved" upon his records. I have reason to believe, from what I have seen in his laboratory, that he continued his experiments, which ended by the death of the specimens, by starting again with similar looking animals. His "Aquarianer" mind did not consider this wrong. He simply did not know what an experiment amounted to. In later years he probably became so absorbed with the necessity for proving his claims that he started inventing results or "doctoring" them. Though the actual results of all this amounted to falsification, I am not certain that he realized it and intended it. He probably was a nervous wreck in the end.

Why did the USSR invite Kammerer to take refuge there from "bourgeois persecution"? One of the strange features of the Soviet religion of dialectic materialism is that it postulates the inheritance of acquired characters as a dogma. The biologist is unable to understand this. One of the underlying ideas is probably that the masses are kept down by a bad environment and that therefore a good environment would make them equal to anyone. If this change is inherited, the future lies in inducing this hereditary improvement. But if this were true, it would follow that the old aristocracy, which had lived so long in the good environment, should be genetically supreme. Of course, one notion is as wrong as the other. Why, then, the dogma of the inheritance of acquired characters? Why can the believer in communism not assume that just as much genetic talent is found in the "suppressed masses" as in the "bourgeois" part of the population and that therefore the communist regime should pick out this talent and give it a chance to blossom? I shall never be able to understand why the latter idea should not be just as good communism as the former and why genuine communism needs the dogma of the inheritance of acquired characters.

This leads us back to the film "Salamandra," which turned out to be nothing but a propaganda film for the doctrine of the inheritance of acquired characters.

It uses the tragic figure of Kammerer, his salamanders, and mixed up with them, for the story, his midwife toads. The importance attached to the subject is revealed by the facts that none other than the then all-powerful Commissar for Education, the highly cultured and intelligent Lunacharsky, is the author of the film, that his wife plays the leading lady and that Lunacharsky, playing himself, appears in one scene. Leaving out the interwoven love story written to fit the beautiful Mme. Lunacharsky, the plot is this: In a central European University a young biologist (model Kammerer) is working. He is a great friend of the people and endowed with all the qualities of a Communist movie hero. Working with salamanders, he has succeeded in changing their color by action of the environment. One day the supreme glory is achieved; the effect is inherited. The bad man of the play, a priest, learns of this, comes to the conclusion that the discovery will spell an end to the power of the church and the privileged classes, and decides to act. He meets at night in the church (I recognized with surprise that these pictures were taken in the glorious double cathedral of Erfurt in Thuringia) with a young prince of the blood whom he had succeeded in having appointed as assistant to Kammerer. (This is obviously a typical job for a German prince!) Here in the dark sacristy the plot is hatched. The prince (or the priest?) proposes to Kammerer that he announce his glorious discovery at a formal University meeting, and the scientist gladly accepts. During the following night the priest and the prince enter Kammerer's laboratory, to which the prince has the key, since he poses as the scientist's devoted collaborator. They open the jar in which the proof specimen of salamander is kept in alcohol, and inject the specimen with ink. Then follows the scene at the University meeting. All the professors and the president appear in academic robes, the young scientist is introduced and makes a brilliant speech announcing the final proof for the inheritance of acquired characters. When the applause has ended the priest (or was it the assistant? I am quoting entirely from memory) steps up, opens the jar, takes out the salamander, and dips it into a jar of water. All the color runs out of the specimen. An immense uproar starts and Kammerer is ingloriously kicked out of the University as an imposter. Some time later, we see the poor young scholar walking the streets and begging with an experimental monkey which had followed him into misery. He is completely forgotten until one of his former Russian students arrives and tries to call on him. She succeeds in finding him, finally, completely down and out, in a miserable attic. She takes the train at once to Moscow and obtains an interview with Lunacharsky (this is the scene where he appears in person), who gives orders to save the victim of bourgeois persecution. Meanwhile, the character Kammerer has sunk so low that he decides to make an end of it. The very moment he tries to commit suicide, the Russian student returns with Lunacharsky's message and prevents him from taking his life. The last scene shows a train in which Kammerer and the Russian savior are riding east and a large streamer reads "To the land of liberty."

A young plant physiologist and agronomist also attended the congress at Leningrad. He was presumably completely ignorant of genetics but he had made a great and well-deserved reputation as an agronomist by the introduction of the method of vernalization which is said to have increased production of crops considerably. His name was Trofim Lysenko—for Russian biology the man of destiny. For some years after 1929 genetics still bloomed in Soviet Russia, especially when H. J. Muller lived there and trained a group of excellent young scientists. But soon rumors began to arise that something strange and untoward was happening in Soviet genetics. The rumors centered around the name of Lysenko. One heard of public debates taking place in which Lysenko attacked genetics as not only scientifically wrong but also not conducive to improvements in agricultural breeding. Simultaneously, he advanced claims of being able to improve plants by environmental action which is at once inherited. Heredity of acquired characters was once again the slogan. Rumors increased that Lysenko's power was in ascendency; they were borne out when Vavilov was prevented from accepting the presidency of the International Genetics Congress in Edinburgh in 1939 and when the expected Russian delegation did not turn up. (I personally think that it was a mistake to elect Vavilov president of that congress. As the honor was clearly intended to back him up in his fight against Lysenko, it appeared to be a political demonstration and as such had just the opposite effect from that intended.)

The first concrete information arrived about 10 years ago when an American monthly, *Science and Society*, published part of the speeches made in the first big debate between Lysenko and the geneticists. These speeches, pro and con, did not impress one favorably. Lysenko's statements of the theories with which he wanted to replace modern genetics sounded like confused nonsense. His antagonists did not come out with clear, simple statements of what is fact and what is interpretation in genetics. One had the uncomfortable feeling, when reading these reports, that Lysenko's opponents were already frightened and spoke cautiously, making unnecessary concessions. It

soon turned out that they had reason to be frightened when Vavilov was deposed and died mysteriously in a concentration camp during the war years, and when all work in plant breeding was taken over by Lysenko. Again one heard from time to time of Lysenko's ascendance, of the honors and titles given to him, among them that of *"Hero of the Soviet State"* and of president of the Lenin Academy of Agriculture. But there were still laboratories of genetics, though one heard that Koltzoff, not long before his death, was forbidden to do genetics work in his institute. Good publications were still appearing in genetics and cytogenetics, and some even reached us by the ordinary mails. During the last three or four years rumors came from Russia that Lysenko's star had passed its zenith and was setting. Then, suddenly last year papers all over the world reported that Lysenko had finally taken over *all* biology in the USSR, that teaching and research in genetics were forbidden, and that all those who opposed Lysenko were deprived of honors, or even jobs, or worse.

Were the rumors of Lysenko's sinking star wrong? A translation of Lysenko's speeches at the decisive meeting has just been published in New York. The complete frankness of Lysenko's statements leaves no doubt about what happened. He quotes a paragraph written by Academician Zhukovsky, stating that the number of theses in genetics is decreasing and that this might be due to fear of what the Lysenkoists may plan. Lysenko counters that the real explanation is that the faculties refuse to accept theses by "geneticists" of the Lysenko school. Simultaneously, he complains that such great Russian scholars as Schmalhausen do not quote him or his worshipped god, the fruit breeder Michurin, in their books. From these and similar statements, it becomes clear that all prominent Russian biologists, geneticists or not, have the same opinion about Lysenko's "discoveries" as we have. He cannot quote in his favor a single living Soviet scientist whose performance is established in the scientific world. The rumor clearly was true that Lysenko's star was sinking in Soviet "science." But the rumor overlooked one thing: that his star was rising among the professional politicians. For both reasons, it seems that he considered the time ripe for action. If he could not win by persuasion, he would win by a coup d'état; this he carried out in the best tradition. In his speech he said suavely that nobody is prevented from working in genetics, though he does not think much of this science. Then he allowed his opponents to say what they wanted. (Thus far, I have not seen translations of their futile speeches.) Then he rose for his final remarks. He began mildly by saying that among the question slips handed to him there was one asking whether his ideas had the official stamp of the party. He answered in the affirmative. I should have liked to see the faces of the scientists who heard this completely friendly and mellow statement. Translated into plain English, it would read correctly: "To all whom it may concern: Lysenko, or else!" Thus, he took over Russian biology exactly after the political pattern established in the satellite countries, by bloodless coup d'état, and we know that the "or else" has already begun.

These last speeches give a much better appraisal of Lysenko and what he stands for and what he is now permitted to enforce than do the earlier publications which have been published in English. He appears clearly in his political roles, which have been more important for his success than his biological claims. (As a corollary one should read the almost simultaneous pronouncements of his brain-truster and *advocatus diaboli,* Prezent.) There does not seem to be any doubt that Lysenko, though a clever politician, is honest and that he believes in his queer ideas, believes in them so religiously that he is willing to impose them by the sword. First of all, he is a fundamentalist. Just as the Christian fundamentalist believes in the divine origin and truth of every word of the Bible, so Lysenko believes in every word of his gods, Marx, Lenin, Stalin, and the Russian Burbank, Michurin. He can refute every argument finally by quoting from these sources. He has set up his rules of the scientific game according to what he considers to be the tenets of dialectic materialism. His views are materialistic and therefore good. All others are decreed idealistic and therefore bad. He does not realize that atomistic classic genetics is extremely materialistic, while his own views border on mysticism. Being a fundamentalist, he simply decides what is right and what is wrong, and there is no appeal. There is also no need for him to study what he condemns, because he knows a priori that it is wrong.

Next to being a fundamentalist, Lysenko is an extremely clever lawyer, almost a shyster. It is revealing to read how he sets up first a completely wrong description of Weismann's ideas and then ridicules his version of them; or how he fights pre-Mendelian ideas as the tenets of present day Mendelism; or how he recounts some technicalities which the nongeneticist cannot understand by quoting literally from Dubinin in order to ridicule genetical work in the eyes of the agronomists and politicians; or how he says on one page that chromosomes, Mendelian segregation, etc., are all figments of the imagination and on another page that he has never doubted the facts relating to all these things; or how he seizes (Prezent does this still better) upon mystical utterances of nongeneticists,

even of popular writers (Prezent quotes from the popularizer Francé, from Smuts, Bergson, Bertalanffi, for all of whose statements genetics is made responsible), to show up genetics as idealistic, which means to him, criminal.

A third part of Lysenko is his chauvinism. Nothing printed appears without mention of *Soviet* science, *Soviet* Darwinism, progressive *Soviet* scientists. The ignorant reader must believe that what Lysenko does and says is 100-percent Soviet Russian, while all his opponents are traitors, imitators of foreign ideas, even promoters of capitalism and similar crimes. He does not mind attacking a Russian scholar of the pre-Soviet group for his heresies, then setting him up on another page as a Soviet scientist, when he defends that man's priority of a good idea (which Lysenko thinks, however, to be bad). I will not insist here that the incense he burns to Stalin is of a type which one formerly knew only from Nazi writers towards Hitler. This is probably the outflow of his religious fanaticism, though it sounds like repulsive adulation. Lysenko is also an able rabble-rouser. The way he presents Dubinin's work on inversions in populations of *Drosophila* is a masterpiece of this type of oratory.

Fourthly, Lysenko is a very skillful politician who knows very well the rules of the game and how and when to act.

But now let us turn to his so-called work. Not, of course, his early physiological work on vernalization but his recent work which convinced him that he is the Allah and the Mohammed of the new Soviet biology which must supplant bourgeois biology, especially genetics, even by fire and sword where mere persuasion fails. One can probably reconstruct Lysenko's development. Being successful as a plant physiologist in improving crops by changing environmental factors and not being trained in genetics, the official governmental support of heredity of acquired characters easily impressed him and suggested a way of helping the breeders with much simpler methods than those of genetics. He found support in the works of his hero, Michurin, who had successfully produced new varieties of fruit and given his own Lamarckian interpretation. Thus, Lysenko set out to develop a Lamarckian theory of heredity and to prove it experimentally. One can consider his biological activities from three aspects: his criticism of the facts and conclusions of genetics, for which he uses the rather silly term Mendelism-Morganism; his own theoretical explanations of heredity; and his alleged proofs of his views.

Lysenko does not think much of genetics and refuses to accept such simple facts as the uniformity of F_1, the numerical rules of segregation, or the chance assortment of chromosomes in meiosis, not to speak of the more advanced facts of genetics. He approvingly quotes Michurin's words that Mendelism ". . . contradicts natural truth in nature, before which no artful structure reared out of wrongly understood phenomena can stand up" and thinks that such mumbo-jumbo settles Mendelism. (He also quotes approvingly Michurin's modest statement that Michurin bequeathes his conclusions "to naturalists of coming centuries and millenniums." (One hears Hitler's voice!) Such elementary facts as the chance assortment of chromosomes Lysenko considers to be mystical nonsense. It is not an overstatement that almost every thing he says about genetics and cytogenetics in his three major translated books and speeches exhibits a complete ignorance of the subject. How is it possible that he has never taken the trouble to see with his own eyes what thousands of students all over the world are unfailingly shown in the laboratory courses in genetics and cytology, year after year? Is this bad will or obscurantism? When I read, for example, that the most important thing for Soviet biologists to do is to read "over again and again" Michurin's works, the only answer I can find is that Lysenko does not want to know the facts which he is attacking because he is a fundamentalist believer, for whom everything is decided in advance. Someone should take the trouble to extract all his statements on modern genetics, so as to have them side by side. The collection would make a stone weep.

Lysenko's second action is the development of his own ideas. Environment is everything and the operation of the environment upon the body changes it permanently. How this comes about is repeatedly stated, e.g. "Heredity is the effect of the concentration of the action of external conditions assimilated by the organism in a series of preceding generations" or, on another page, "Heredity is the property of a living body to require definite conditions for its life and development and to respond in a definite way to various conditions"; then, concerning changes in heredity: "Changes in heredity are as a rule a result of the organism's development under external conditions which, to some extent or other, do not correspond to the natural requirements of the given organic form" or "The extent of hereditary transmission of alterations depends on the extent to which the substances of the altered section of the body join in the process which leads to the formation of reproductive sexual or vegetative cells. Once we know how the heredity of an organism is built up, we can change it in a definite direction by creating definite conditions at a definite moment in the development of an organism" and so forth *ad nauseam*. The same man who produces this

mystical and empty phraseology (though it can be called by a more appropriate name) derides modern genetics, with its clear-cut verifiable facts and wonderful parallelism of experimental results with cytological facts, both easily verified by any beginner; he calls modern genetics "idealistic, mystical nonsense," and his brain-truster, Prezent, even denounces genetics as made to order for the benefit of the capitalist employers of the geneticists; and, *horribile dictu,* he believes fanatically in this evident nonsense. I repeat that not a single USSR biologist of renown, all of them probably good Communists, is willing to take seriously Lysenko's so-called biology. Lysenko had to pack the Lenin Academy with his cohorts, as he naively states in his last paper, to create an audience for his theories. As for those who do not follow him there is a sinister meaning in a list of errata appended to a German translation of his speeches. It reads: "p. 24, first §, instead of ". . . straight lined action of *our Soviet* Cytogeneticist-Morganists" read: "straight lined action of *our home-grown* Cytogeneticists-Morganists" (Italics mine).

Biologists, however, are interested mostly in the facts which Lysenko claims to have found in proof of the inheritance of acquired characters. One should expect Lysenko to put these facts in the foreground of his discussion when he wants to convince his fellow geneticists. Actually, reports on facts play a rather modest role in his accessible writings, and they are always presented in a vague, elusive way. In his decisive discussion of his views, just before he staged his *coup d'état,* he tells us rather vaguely, as before, that he can change hereditary winter grain rapidly and at will into hereditary summer grain simply by changing the time of planting. He must certainly be aware that no one will believe this story unless it can be shown that his experiments have been made with all the precautions, controls, and checks which a knowledge of genetics requires. But he quietly skims over this subject. Being a believer and not a critical student, he obviously expects others to believe him, without question. But no one will believe his statements before seeing exact data on experimental procedure, controls, and statistical checks. At present, it seems that Lysenko considers another line of his work to be most decisive. Following in the footsteps of Michurin, he and his school have grafted on a large scale and claim to have produced many "graft hybrids," which are supposed to show that the "juices" which flow from stock to scion and vice versa can change the scion (or stock) hereditarily into the type of the other. We can judge what he believes to be his greatest success, his star witness, because he staged a dramatic demonstration toward the end of his final remarks at the 1948 meeting mentioned above. He directly addressed the Academician Zhukovsky, who had doubted (like everybody else) the reality of the existence of vegetative hybrids, and declared in a triumphant tone that he now had the pleasure of demonstrating them. A tomato strain with full leaves and red oblong fruits was used as a stock to which a scion was grafted from a strain with pinnate leaves and yellowish white fruit. Seed was taken from fruits growing on the stock and on the scion and most behaved according to their origins. But a few plants taken from the seeds from the stock had pinnate leaves and yellow fruit. This, then, was his great result, produced dramatically at the height of his discussion. I am sure that the agronomists present were deeply impressed. But what did the geneticists think? Before Lysenko's unfounded interpretation could be discussed, one might ask, first, whether no genetical facts are known in explanation of the result, assuming that the experiment was made with genetically pure strains. It has been known ever since the classic work of Winkler and Baur that chimeras are produced in definite ways after grafting. This means that the tissues of stock and scion can grow together into a whole. It was shown further that the subepidermal layer, from which the sex cells originate, can enter such a chimera from one or the other form used. The seed then will belong to the form which furnished the subepidermal layer, as Winkler proved by the chromosome counts in his nightshade-tomato grafts. (Winkler, by the way, produced also a single real graft hybrid or burdo, not by "juices" but by vegetative union of cells, as again proved by the chromosomes.) Obviously, the pinnate, yellow-producing seeds of Lysenko were pure descendants of the scion, via subepidermal ingrowth into the stock. If this fact-founded interpretation cannot be disproved by real and decisive facts, Lysenko's top demonstration collapses. Thus far, I have not seen any hint that Lysenko was even aware of a simple genetical explanation for his results. [In his book, translated and published in 1946, Lysenko discusses chimeras (p. 57). In these paragraphs he surpasses himself in ignorance, if not actual ill will.]

It is not necessary to go on with a discussion of Lysenko's so-called factual material, when his own star-witness experiments are found wanting in every respect. To base a revolution in biology upon such material is certainly a feat of great optimism, though not of much self-criticism. *Parturiunt montes nascetur ridiculus mus.*

Pseudobiological literature of all times is full of books by philosophers, statesmen, theologians, and cranks who want to replace facts and laws found by the hard work of the active biologists with their own

pet ideas or creeds. Lysenko would certainly join this group, which always finds followers among laymen, if he lived in the Western World, and his doings would remain a curiosity on a library shelf. However, his case, otherwise completely uninteresting, has become entirely significant by the fact that he has succeeded in persuading the high command of the party, including, as it seems, the dictator himself, that his, Lysenko's, line is first, truly Marxian, second, of greatest importance for the economy of his country and full of practical promise, and, third, 100 percent Soviet Russian; further, that scientific genetics is anti-Marxian, capitalist-employed, a foreign importation, wrong in fact and theory and a hindrance to agricultural progress. Thus far, this is a local Russian affair. But when, in consequence, the politicians have given him the power to destroy a whole science of greatest achievement and to persecute its exponents, a situation has developed which must awaken the entire world. We know that Communism is a creed and that its believers everywhere will follow the party line religiously. We know that in the Eastern Zone of Germany, Lysenkoism is already being introduced in the high school curriculum. We know that the red-tainted Japanese youth is already flirting with Lysenkoism and that a large scale discussion of it is going on in the Japanese press. Thus, the freedom of science is in danger everywhere, and the local affair becomes one of universal concern.

I do not want to imply that we are in danger of having a Lysenko appear in our midst. But there are different degrees of such things. This brings me back to the fourth recent development in science which I recounted in the introduction to this address, when I said that only small steps lead from organized teamwork to professional planners and finally to political control. I cannot help saying that I have followed with serious misgivings the increasing trend towards planned and organized science, though realizing its need in certain fields. Formerly, a scientist thought out or encountered a problem and started working on it. As often as not he found something in the course of the work which led him in a new direction. An occasional observation, which most others would have overlooked, led the born researcher into new fields, an unexpected flash of an idea opened new vistas and led to solutions or to more problems. All great ideas and all great discoveries in the realm of pure science have come into existence this way.

But now a man does not work on some subject or problem. He has a "project." A plan has been laid out, even worked out in all detail, a staff has been brought together and each one has been assigned his duty. An organization has approved the plan and furnished the funds; in return it expects progress re- ports, visible and quick results, and no deviation fr the plan agreed upon. Everybody is happy to ha a "project," and only Minerva covers her face a sends the owl away to catch mice.

I realize certainly that there are types of wo which should be handled as organized "projects." you want to prepare 200 stereoisomers of some orga compound and test their action as insecticides, project is in order. If you want to eradicate a ce tain mosquito in a certain place, go and organize But how a major discovery or idea can come from project I am unable to understand. This, however, not what I want to discuss. I want, rather, to poi to the danger to the freedom of science which lur behind this way of making science. The danger w come from the men who are attracted to such a ty of scientific big business. The thinker, the blaster new paths, the keen observer, the man of intuitio whose thinking is ahead of his time, will not flo to the big Government-financed and -sponsored pro ects. Sooner or later leadership will fall to the u versity politician, the promoter, the men who mak the headlines—headlines not in the history of di covery but in the press. Second-raters will attain th power that goes with the big funds, and then the mo ment of danger arrives. They will favor what the like and understand, suppress what is beyond the vision. Being not too intelligent, they will fall prey t the flatterer, and will always go along with the late scientific fashion or even the doubtful schemes of fa natics or reactionaries, and certainly always with well entrenched schools. They will easily find the ear o the politicians who run the funds, for both talk the same language. At this point the setting is ready fo a Lysenko type. Though our political system will no give him a chance to act as savagely as is possible i Russia, he could do enormous damage to the progres of science and the freedom of research if not checke in time. This sounds very pessimistic, but human nature is the same everywhere, fanatical activists ar available everywhere if not kept in check, and men who believe in "politics as usual" are not only more numerous than men of original ideas but are also more selfish and ruthless. Thus, I believe that the increas- ing financial support of research, especially by govern- ment and political agencies, tending to flow into the channels of organized research, is fraught with the danger of bossism in science, with the danger of sub- sidizing mediocrity, and in the end with a threat to the freedom of science and its teaching. This is not to say that I am opposed to government funds' being set aside for fundamental research. This is a need of our time, a necessity. But precautions should be taken

and a watchful eye should be kept to prevent such funds from working to the detriment of real science. It is the young generation, who will profit from the incoming funds, who should also be alerted against the danger that politicians, both those within and those outside the universities, will take over science. The young researcher must insist upon the right to think for himself, to plan for himself, to make his own mistakes, and to be happy over an unplanned, unforeseen discovery. Real progress in science has always been made and will always be made by the free mind, left to its own working under a system where science is free.

Based upon a presidential address given at a meeting of the Phi Sigma Society held December 30, 1948 at the University of New Mexico.

Age Determination by Radiocarbon Content: World-Wide Assay of Natural Radiocarbon[1]

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SOME TIME AGO THE OCCURRENCE of radiocarbon in living matter and dissolved ocean carbonate was reported (*1, 2, 4, 5*) as a result of researches on sewage methane gas from the City of Baltimore. The postulated origin (*5*)—cosmic ray neutrons reacting with atmospheric nitrogen to give radiocarbon at high altitudes—clearly predicted that all material in the life cycle and all material exchangeable with atmospheric carbon dioxide, such as carbonate dissolved in sea water, would be radioactive. The long half-life of radiocarbon, 5,720 ± 47 years (*3*), further seemed to ensure that the mixing processes would have ample time to distribute the radiocarbon uniformly throughout the world.

Since completing the first tests using isotopic enrichment with Dr. Grosse and his associates, an improvement in counting technique has enabled us to investigate materials without enrichment to about 5–10% error. The samples are counted in the form of elementary carbon in a screen wall counter (*6*). Six grams of carbon are spread uniformly over an area of 300 cm², to give an "infinitely thick" layer; about 5.9% of the disintegrations register in this arrangement. The background of the counter has been reduced from 150 cpm (when shielded by 2″ of lead) to 10 cpm by means of anti-coincidence shielding and the addition of a 4″ iron liner inside the lead shield. The technique will be described in detail elsewhere. A world-wide assay has been completed, and the uniformity apparently established. The data are presented in Table 1.

TABLE 1

WORLD-WIDE ASSAY OF RADIOCARBON

Sample	Assay (cpm/gm of carbon)
Baltimore sewage methane (*1, 2*)	10.5 ± 1
Ironwood from Marshall Islands	11.5 ± 0.6
" " " "	12.6 ± 1.0
Elmwood, Chicago Campus	12.7 ± 0.8
" " "	11.9 ± 0.7
Pine, Mt. Wilson, New Mexico, (10,000′ altitude)	12.5 ± 0.6
Bolivian wood	13.5 ± 0.6
" "	11.3 ± 0.8
Ceylon wood	12.5 ± 0.7
Tierra del Fuego wood	12.8 ± 0.5
Panamanian wood	13.0 ± 0.5
Palestinian wood	12.4 ± 0.4
Swedish wood	12.6 ± 0.5
New South Wales wood	13.3 ± 0.4
North African wood	11.9 ± 0.4
Weighted average	12.5 ± 0.2
Sea shell, Florida west coast	13.3 ± 0.5
" " " " "	14.9 ± 0.7
" " " " "	14.6 ± 0.5
Weighted average	14.1 ± 0.3
Seal oil, Antarctic	10.4 ± 0.7

The numbers quoted are intended to be absolute disintegration rates per gram of carbon. It must be

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[2] DuPont Fellow in Chemistry.

said, however, that our absolute calibration of the counters used may have as much as 10% error. We hope to improve this in the near future. Since all the samples were measured with the same technique, the relative comparison does not involve this point. With the exception of the Antarctic seal sample, which has been run only once to date, the uniformity is well within experimental error. Since one expects the arctic samples if anything to be high, because the neutron intensity is lowest at the equator and rises towards the poles (*9*), and since the deviation of the seal oil from the mean is not much larger than the error of the measurement, it is believed that further measurements will show this sample to be normal also. The result on the sea shell sample is interesting. It has been shown (*7, 8*) that C^{13} occurs in higher abundance in carbonates than in organic material. The result we find for radiocarbon in sea shells versus wood and other organic material is in line with this earlier finding for C^{13}. It is true, however, that the difference may be somewhat larger in our case than that predicted from the earlier results, though the error of our measurement is so large at present as to well overlap the predicted value.

Age Determination

Having established the world-wide uniformity of the radiocarbon assay at the present time, it seems a logical assumption that this would have been true in ancient times. Assuming this, and using the half-life of radiocarbon, 5,720 ± 47 years (*2*), one can calculate the specific activity to be expected after any given time interval elapsed since the removal of any carbonaceous material from equilibrium with the life cycle. For living materials this probably coincides with the time of death; for carbonates it would correspond to the time of crystallization (assuming no further interchange with the solution or atmospheric carbon dioxide to occur). On this basis we have undertaken examination of wood samples of well established age from the ancient Egyptian tombs. Two such samples were used, one from the tomb of Sneferu at Meydum (furnished by Froelich Rainey, of the University of Pennsylvania Museum, Philadelphia) which was 4,575 ± 75 years old; the other from the tomb of Zoser at Sakkara (furnished by Ambrose Lansing, of the Metropolitan Museum of New York) which was 4,650 ± 75 years old. The former sample is cypress wood; the latter is acacia. John Wilson, of the Oriental Institute of the University of Chicago, has given the dates quoted, at the behest of a committee of the American Anthropological Association, consisting of Frederick Johnson, chairman, Froelich Rainey, and Donald Col-

TABLE 2

Age Detemination on the Ancient Egyptian Samples

Sample	Specific activity found (cpm/gm of carbon)
Zoser	7.88 ± 0.74
"	7.36 ± 0.53
Sneferu	6.95 ± 0.40
"	7.42 ± 0.38
"	6.26 ± 0.41
Weighted average (both samples)	7.04 ± 0.20
Expected value	7.15 ± 0.15

lier. The expected assay for 4,600-year material is easily calculated to be 7.15 ± 0.15 cpm/gm of carbon on the basis of the present assay and the half-life. Table 2 presents the data obtained on these materials.

The data on both samples were averaged since the error in ages almost overlaps the difference, and the weighting was taken according to the error quoted in each run. The errors quoted here and in Table 1 also are standard deviations determined strictly from the statistical counting error, and, since the data agree within these errors, we believe that no other appreciable error is involved in the measurement. It is gratifying that the mean of the determinations agrees with the expected value within 1 standard deviation unit. An error of 0.4 cpm/gm in the specific activity corresponds to an error of 450 years in a 4,600-year-old sample.

On this basis we feel encouraged to proceed with further tests on younger samples of known age. This work is now in progress. It is hoped that certain unknowns can be measured in the near future. A large thermal diffusion column similar to the one used by Dr. Grosse and his associates has been installed in the laboratory and a considerable increase in accuracy should result, permitting the measurement of samples as old as 20,000 to 25,000 years.

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TECHNICAL PAPERS

1-C^{14}-D-Glucose and 1-C^{14}-D-Mannose

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Radioactive C^{14} was first incorporated in the hexose molecule by allowing green plants to assimilate $C^{14}O_2$ (*2*). The resulting glucose contained C^{14} in all positions of the carbon chain, with the highest concentration of the radioactivity in carbons 3 and 4 (*1*). Starch labeled with isotopic C^{13} also has been prepared by growing plants in an atmosphere of $C^{13}O_2$ (*3*).

Previously, glycogen containing isotopic C^{11} had been produced by injecting $NaHC^{11}O_3$ into rats being fed nonradioactive sodium lactate (*7*). Evidence was subsequently obtained, using C^{13}, that the biosynthetic glucose comprising the glycogen was labeled only in carbons 3 and 4 (*9*). This synthesis of labeled glucose has recently been employed with $NaHC^{14}O_3$ (*10*).

For studies of the fate of hexose in experiments that involve fragmentation of the molecule, the need was apparent for a glucose containing C^{14} in only one known position of the carbon chain, preferably in the reactive reducing group of carbon 1.

D-Glucose and D-mannose labeled with C^{14} in the aldehyde carbon have now been prepared in the crystalline state by application of the nitromethane synthesis (*8*) to D-arabinose.

Sixteen grams of C^{14}-methanol containing 4 mc of radioactivity was converted to 60 gm of methyl iodide by the method of Norris (*6*). By application of the Victor Meyer reaction (*4*) with silver nitrite, the methyl iodide yielded 18 gm of nitromethane and 4 gm of the isomeric methyl nitrite. Condensation of the nitromethane with D-arabinose yielded, after separation and purification, 11.0 gm of 1-nitro-1-desoxy-D-mannitol and 10 gm of 1-nitro-1-desoxy-D-glucitol. Conversion of the respective nitroalcohols to the corresponding hexoses by the Nef reaction (*5*, *8*) gave D-mannose phenylhydrazone in 80% yield and crystalline D-glucose in 60% yield. Crystalline D-mannose was obtained from the phenyl hydrazone in 90% yield by cleavage with benzaldehyde.

The sugars, whose calculated specific activity is .044 μc/mg showed an observed activity of approximately 2,000 cpm/mg when counted from a thin layer in the G.C.L.-Nucleometer.[1]

Experimental details will be published elsewhere.

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Crushing Strengths of Minerals at Low Temperatures

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An attempt was made to measure and evaluate the effects of subnormal temperatures on the crushing strengths of several available common minerals (prochlorite, serpentine, graphite, selenite, and halite).

In all cases except that of halite, cylindrical samples 0.4″ in diameter were cut from mineral masses by means of a milled hollow tool. Ends of the samples were squared and polished on a lapping wheel to ensure equal distribution of the pressure applied. All halite samples were nearly perfect cubes cleaved from a single mass.

The apparatus used to produce and measure the force applied consisted essentially of a hydraulic jack with a registering pressure gauge attached. Containers fashioned of sheet aluminum, asbestos insulated, permitted cooling of the test samples in place. Dry ice and liquid oxygen were used as refrigerating agents, tests being made at room temperature, – 78.7° C, and – 183° C.

Pressure was applied at opposite ends of the samples, normal to the planes of cleavage when cleavage was present. Since halite cleaves in three planes at right angles, two planes of cleavage therefore lay parallel to the direction of force.

Graphite exhibited a decelerating increase in crushing strength with decrease in temperature, while prochlorite, serpentine, and selenite showed an accelerating increase. Halite, contrary to the others, showed an accelerating *decrease* in crushing strength with decrease in temperature. (The crushing strength of halite dropped from 11,850 PPSI to 3,250 PPSI with a decrease in temperature from 25° C to – 183° C.)

Since halite presented two planes of cleavage parallel to the direction of pressure applied, it is probable that in this case the results involved not only a change in crushing strength but an increased ease of cleaving with lowered temperature.

The changes in crushing strength with temperature

change from 25° C to −183° C were as follows: serpentine, +517%; prochlorite, +227%; selenite, +129%; graphite, +104%; and halite, −72%.

A Microscope Stage for Continuous Anesthesia of Insects

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Williams (*1*) described a method of continuous anesthesia for insects using carbon dioxide with a Buchner funnel as the anesthetizing cell, the insects being placed in the open depression of the funnel. The Buchner funnel must be mounted flush in the top of a table or used with a microscope having an elevated stage with the funnel fitted to a metal plate which is substituted for the glass stage.

Work in this laboratory requires that small insects such as clothes moths, flour beetles, and mosquitoes be held under continuous anesthesia during experimental manipulation. When operating on small insects, a shallow stage in which the sides of the anesthetizing cell do not interfere with the dissecting instruments is preferred. It is also desirable that the microscope with the stage in place be readily moved to any table for use without an elevated stage. The anesthetizing stage shown in Fig. 1 was designed for use with a Spencer stereoscopic microscope; however, the device can be adapted for use with any similar type of microscope.

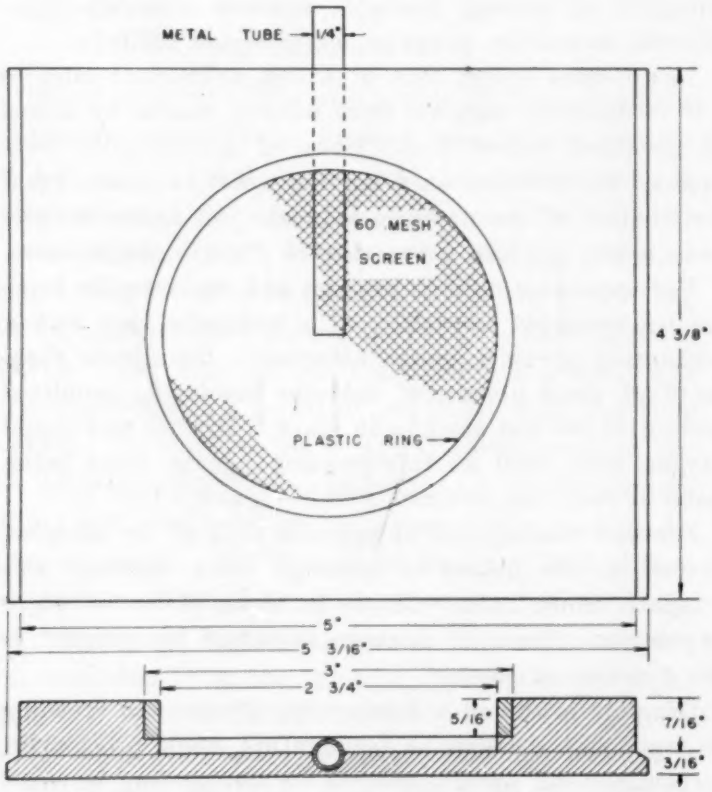

FIG. 1. Plan and cross section drawings of anesthetizing stage.

The stage is made from two plates with the cell cut in the upper plate (see cross section in Fig. 1). The wider lower plate that forms the bottom of the cell slides into the base of the microscope. A hole is drilled between the two plates to receive a metal tube connection for carbon dioxide. The connection opens into the center of the cell in the space between the bottom plate and the screen above. A shoulder is machined around the periphery of the cell opening in the upper plate, against which a disc of 60-mesh screen is held by a tightly fitting plastic ring. If deeper cells are needed for use with larger insects, the height can be increased by using plastic rings which will project as far as necessary above the plate. Steel was used for the plates that form the stage, although aluminum or plastic would have the advantages of lightness and resistance to corrosion from perspiration. The diameter of the cell is larger than the field of the microscope at the lowest magnification; for use at higher magnifications the cell diameter might advantageously be reduced. The stage in place in the microscope is shown in Fig. 2.

FIG. 2. Anesthetizing stage in position in dissecting microscope.

This stage permits convenient experimental micrurgy of small insects under continuous carbon dioxide anesthesia. It eliminates the Buchner funnel, which has been used previously, and has the advantages of not requiring a permanent mounting in a table or the use of an elevated stage for the microscope.

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Changes in Bark Thickness During Sap Flow in Sugar Maples[1]

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The phenomenon of sap flow in sugar maple, *Acer saccharophorum* Koch (*Acer saccharum* Marsh), and other species has been the subject of investigation for many years (*4, 7, 6, 3*). Burstrom and Krogh (*1*) have added valuable observations on *Carpinus*.

TABLE 1

			Exp. 1		Exp. 2			
Date	Time	Air temp. (°C)	Changes in bark thickness (μ) Avg. 14 trees	Xylem temp. (°C)	Changes in bark thickness (μ) Avg. 2 trees	Changes in xylem diameter (μ) Avg. 2 trees	Change in 10 mm of xylem diameter (μ) Avg. 2 trees
4/3	10 : 30 a.m.	− 3		+ 7			
					+ 30	− 64	− 1.39
	3 : 15 p.m.	− 3		+ 4			
			− 63		− 88	− 16	− .35
4/4	5 : 45 a.m.	− 6		− 1			
			+ 72		+ 82	+ 55	+ 1.20
	12 : 15 p.m.	+ 7		+ 1			
			− 3		+ 7	+ 11	+ .24
4/5	6 : 00 a.m.	+ 8		+ 2			
			− 9		− 6	+ 2	+ .04
	1 : 40 p.m.	+ 19		+ 6			
			+ 8		+ 6	− 37	− .80
4/6	4 : 45 p.m.	+ 12		+ 11			
			− 1		+ 5	− 7	− .15
4/7	6 : 00 a.m.	+ 2		+ 10			
			− 2		− 16	+ 36	+ .78
	3 : 45 p.m.	+ 15		+ 9			
			+ 4		+ 5	+ 1	+ .02
4/8	3 : 15 p.m.	+ 14		+ 11			
			+ 1		− 5	− 6	− .13
4/9	2 : 45 p.m.	− 2		+ 9			
			− 83		− 87	− 20	− .43
4/10	5 : 45 a.m.	− 8		+ 5			
			+ 80		+ 89	+ 36	+ .78
	2 : 45 p.m.	+ 2		+ 3			
			− 48		− 40	− 26	− .56
4/11	6 : 00 a.m.	− 2		+ 3			
			+ 48		+ 35	+ 31	+ .67
	12 : 00 noon	+ 4		+ 2			
			+ 25		+ 52	+ 5	+ .11
4/12	9 : 00 a.m.	+ 11		+ 5			
			± 0		− 21	− 16	− .35
	5 : 00 p m.	+ 12		+ 8			
			− 1		− 9	− 9	− .20
4/13	2 : 00 p.m.	+ 11		+ 7			

No completely satisfactory explanation of the mechanism responsible for the transitory xylem pressure and sap flow has been suggested. Stevens and Eggert show that excised red maple stems when supplied with water and allowed to freeze and thaw in nature produce a flow of sap, which demonstrates that roots are not essential for a xylem pressure. They also suggest that xylem pressures are the result of the change in state from ice to a liquid solution of the vessel sap. Johnson is of the opinion that respiration rate changes produce the pressure and that oxygen tension in the tissues is of great importance. Burstrom regards an osmotic mechanism involving the living cells in the xylem and the contents of the xylem vessels as the best explanation for bleeding in *Carpinus*. Wiegand, in a theoretical exposition three decades earlier, considered several possible mechanisms. He concluded that, as a result of temperature changes in the stem, an osmotic gradient occurred between the contents of the xylem vessels and the adjacent living cells. Thus, water or a solution moved into the vessels and created a pressure.

In experiments designed to study the tissues that are active in the flow mechanism, it was found that when the tissues exterior to the xylem were removed no flow occurred. To investigate the physical changes in the bark, further studies were made in the field on mature trees during the spring of 1948. The results of these field observations are reported here.

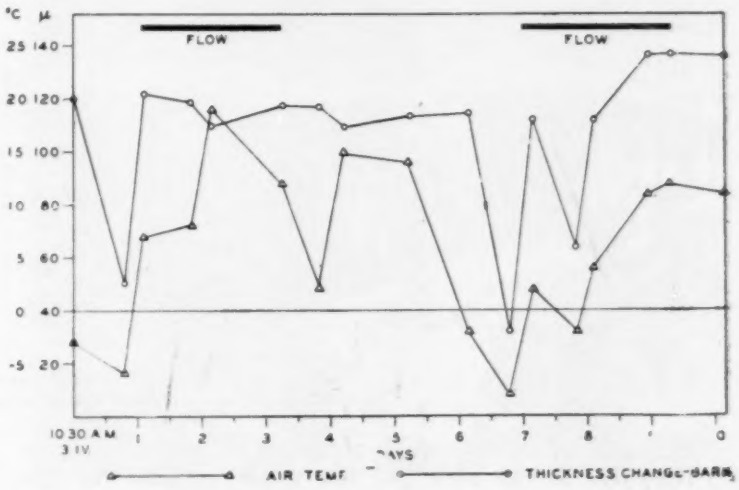

FIG. 1. Air temperatures and the changes in bark thickness. The changes are the average for the 14 trees measured.

Air temperatures were recorded, and the changes in bark thickness measured with a micrometer during and between periods of flow after the technique of Reineke (*5*) and Daubenmire (*2*). Screws were inserted into the wood through holes in the bark and measurements were made between the heads of the screws and the surface of the bark; in this way changes in bark thickness rather than the bark thickness were recorded. These observations were made four feet above the ground on nearly mature trees. Changes in air temperature affected the micrometer and corrections were then made for these changes. Table 1 (experiment 1) and Fig. 1 show the changes in bark thickness which occurred between two successive measurements of 14 trees during two freezing periods and for the four-day period of high temperatures between freezes. During the cooling and freezing part of the diurnal temperature cycle as observed in the field, the bark decreased in thickness. A warm temperature fol-

[1] Published with the permission of the Director of the Vermont Agricultural Experiment Station.

lowing the freeze was accompanied by a rapid increase in bark thickness of about the same magnitude as the previous decrease. For example, between 2:45 p.m., April 9, and 5:45 a.m., April 10, a freeze occurred, and the difference between the readings of the bark thickness for those two observations was $-83\,\mu$. Between 5:45 a.m., and 2:45 p.m. April 10 a thaw occurred, and the bark increased $+80\,\mu$. During the flow period there was some decrease in bark thickness. Changes also occurred during the period of elevated temperatures, but none of great magnitude occurred until the stem again froze.

To correlate changes in bark thickness with those in the xylem, changes in the diameter of the xylem cylinder were measured. A hole was drilled through the stem and

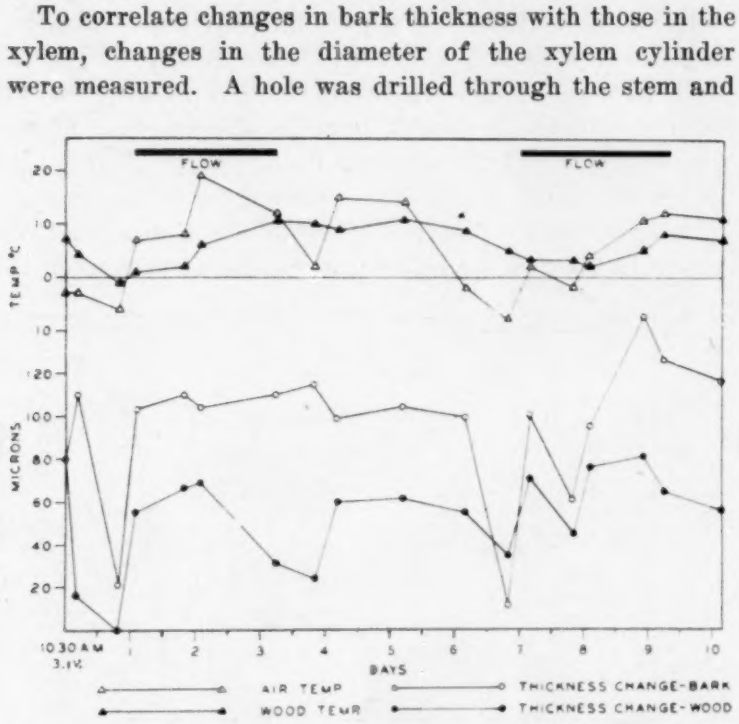

FIG. 2. The lower graph illustrates the changes in thickness of the bark and the xylem cylinder for the 2 trees measured. The upper graph illustrates air temperature and wood temperature for the same period.

an invar steel rod of a length equal to the tree's diameter was placed in the hole. The rod was fastened to the xylem on one side of the tree and the measurements were made between the end of the rod and the surface of the xylem cylinder on the other side of the tree. Corrections were made for thermal changes in the length of the rod. The observed changes in bark thickness, wood thickness, and wood temperature are illustrated in the table (experiment 2) Fig. 2. The changes observed are comparable to those found in experiment 1.

The xylem cylinder also changed in diameter at the time the changes occurred in the bark, and the change was in the same direction as that observed for the bark (see experiment 2). The magnitude of the change in the xylem is quite different from that of the bark. The bark changes were measured for a thickness of about 1 cm; the changes for the xylem, for a xylem cylinder 46 cm in diameter. Thus, the change recorded for the wood for any period should be multiplied by .022 to compare the two tissues on a unit of thickness basis. For example, between 5:45 a.m. and 12:15 p.m. on April 4 the bark increased $82\,\mu$ in diameter, and the xylem cylinder $55\,\mu$ in diameter. However, 1 cm of the xylem diameter increased only $1.20\,\mu$; thus, the change recorded for the wood per unit of thickness was much less than that of the bark. A detailed analysis of the factors responsible for these changes is in progress.

The present observations which show that flow is preceded by a transient decrease in bark thickness induced by a transient freezing ambient temperature indicates that the bark must at least be considered in a discussion of the mechanism of sap flow.

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The Effect of Water Diuresis on Renal Plasma Flow[1]

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The effect of water diuresis on renal plasma flow in the human being has never been clearly defined. The subject has, however, been studied in various laboratory animals. Dicker and Heller (*3*), working with rats and

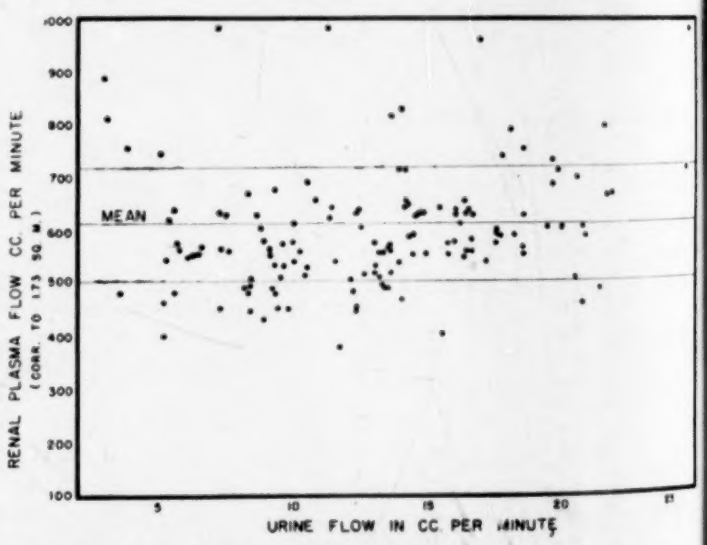

FIG. 1. Renal plasma flow at various rates of urine flow. Each dot represents a separate clearance period.

rabbits, found that in the former species water diuresis had little or no effect on glomerular filtration rate or renal plasma flow; in the latter species both clearances rose as urine flow increased. The authors did not extend their studies to the human subject.

In devising a technique for the study of renal plasma flow in the human subject during exercise (*1*) we found it desirable to institute moderate water diuresis in order

[1] This research was aided by the Research Grants Division, U. S. Public Health Service.

to overcome the antidiuretic effect of exercise. Since water diuresis, itself a stress of a sort, might conceivably affect renal plasma flow in the human subject, it was necessary to obtain specific information on the point.

Full details of the method have been reported elsewhere (*1*). Renal plasma flow was determined under basal conditions in 9 normal young men by the *p*-aminohippurate clearance technique. There was a total of 59 experiments and 140 basal clearance periods. Water was given by mouth in varying amounts before and during the clearance determinations. Urine samples were collected by voluntary micturition.

Fig. 1 shows that there is no significant trend in renal plasma flow at rates of urine flow varying from 5 to 20 cc/min. Renal plasma flow at lower rates of urine flow were not studied, but the mean figure obtained in the present work (613 ± 107 cc) is not significantly different from that obtained by other workers (*2, 4*) employing low rates of urine flow. This suggests that neither moderate water diuresis nor substitution of voluntary micturition for catheterization affects renal plasma flow in healthy young men.

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Acid Phosphomonesterase Activity of Human Neoplastic Tissue[1]

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Massachusetts Memorial Hospitals, and
Department of Medicine,
Boston University School of Medicine

Since the development of a method of histological demonstration of enzymes hydrolyzing mono-phosphate esters in acid hydrogen ion concentrations (*3*), it has been shown that the nuclei of cells of almost all human tissues react strongly (*10*). Neurones and prostatic epithelium alone exhibit heavy cytoplasmic staining (*1, 2, 10*). In most of this work, however, the deleterious effects of protein denaturation during fixation and heating for paraffin embedding have been ignored, resulting in inconstant staining and variable localization of the precipitate forming during incubation. In developing our method for simultaneous quantitative estimation of activity of this enzyme along with its cytological localization, we noted, as did others (*1, 8*), these factors which are to be avoided in precise work. In addition we have attempted to preserve cellular integrity to a greater extent than that usually attained in biochemical methods used in the past to measure tissue phosphatases (*11*).

Utilizing the procedures outlined below we have been able to obtain reproducible measurements of activity of this universal nuclear component of human tissues on specimens no larger than those obtained in the usual surgical biopsy. We have found that it appears definitely related to rate of tissue growth and secretion. Moreover, human cancers exhibit a uniform increase in nuclear acid phosphatase when compared with homologous tissues of origin.

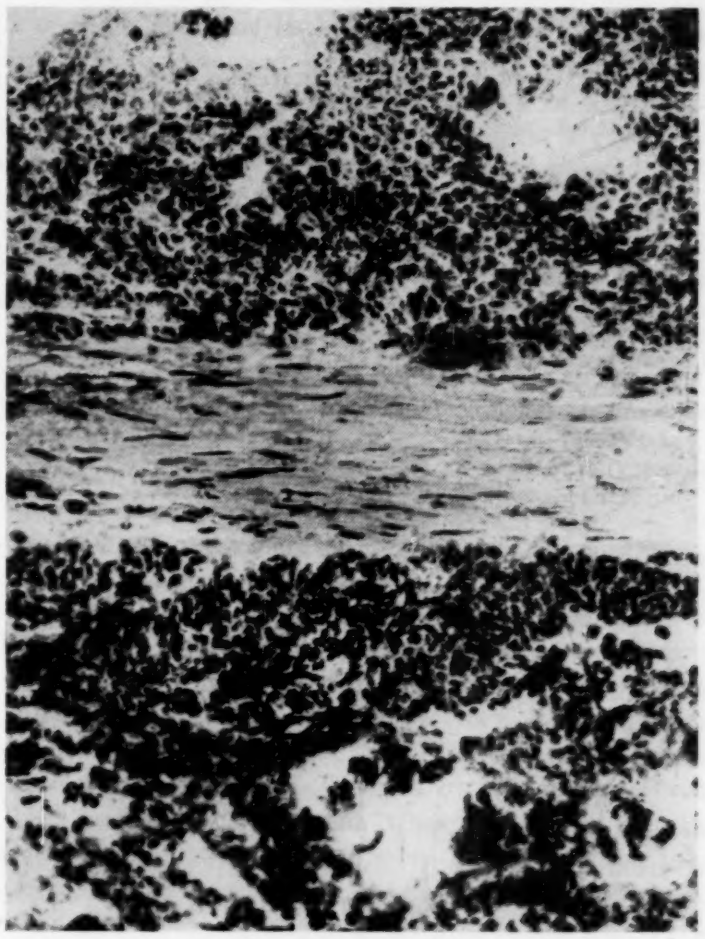

Fig. 1. Advancing margin of carcinoma of stomach, stained for acid phosphatase after 30-min incubation. Central area of normal muscularis with infiltrating tumor on each side. The black areas indicate lead sulfide precipitate within nuclei, at the site of maximum phosphatase activity. The cytoplasm has been lightly counterstained with fast green. (400×).

The methods used have been as follows: small blocks of tissue 1–2 cm in length and a few mm wide and thick are removed from freshly obtained surgical specimens, usually adjacent to blocks obtained for pathological diagnosis. Normal gastrointestinal epithelium for control studies in gastrointestinal cancers is dissected free from the muscularis. In the case of fibroids, blocks from the central but nondegenerated part of the fibroid are removed for comparison with adjacent blocks of homogeneous and grossly uninvolved myometrium. In malignant tumors it is always a problem to obtain a block which will be rich in viable cancer tissue, approaching the epithelium of origin in density of cells. We have usually sampled the

[1] This research was assisted in part by Cancer Teaching Grant CT-618 from the U. S. Public Health Service.

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edge of the advancing tumor, at times including a thin margin of uninvolved normal tissue (Fig. 1). We have learned to avoid the sclerotic base of many cancers which are relatively poor in malignant cells, and have had best results with sampling the soft fungating surface of polypoid lesions when such are available.

phosphatase activity after the procedure devised by Gomori (*3*) and with hematoxylin and eosin. We have used 0.01 molar sodium glycerophosphate (52% alpha)[a] for the substrate in all our tests, buffered at a pH of 5.0 ± 0.1 with acetate buffer. We have found that 0.060 molar sodium acetate buffer gives best results for histological

TABLE 1

QUANTITATIVE ACID PHOSPHATASE ACTIVITY OF HUMAN NEOPLASMS COMPARED WITH TISSUES OF ORIGIN*

Source of tissue	Normal			Benign tumors Qap	Carcinoma Qap	Ratio
	Qap whole tissue	Qap smooth muscle	Qap epithelium or mucosa			
Stomach, ileum, colon, and rectum (mean of 10 cases)		.020 ± .009	.093 ± .034			4.7 ± 2.1
Uterine myometrium compared with leiomyomata (mean of 7 cases)		.018 ± .008		.012 ± .008		0.69 ± 0.21
Breast (not including skin)	.002				.008	4.0
	.029				.398	14
	.004				.073	18
Bronchus	.024				.214	8.9
	.066				.077	1.2†
	.022				.040	1.8
	.017				.051	3.0
Skin	.010				.063	6.6
	.029				.102	3.5
	.016				.028	1.8
Bladder	.009				.046	5.1
Esophagus	.012				.106	8.8
Stomach	.013				.030	2.3
						mean = 6.1 ± 4.6
Stomach, colon, and rectum		.066		.104		1.6
		.083		.193		2.3
		.084		.210		2.5
		.030		.027		.90‡
		.175		.287		1.6
		.018		.034		1.9
		.078		.173		2.2
		.067		.167		2.5
		.038		.067		1.8
		.081		.140		1.7
		.071		.119		1.7
		.054		.072		1.3
		.152		.192		1.3
						mean = 1.8 ± 0.5

* Each pair of values represents a different consecutive case; ± indicates standard deviation of observations from mean.
† Nitrogen mustard injected into pulmonary artery of isolated lung just prior to resection.
‡ Estimated proportion of neoplastic cells in tumor block only 52%.

The unfixed tissue specimens may be quickly frozen in serology tubes immersed in a mixture of dry ice and acetone, and then stored in a dry ice chest without marked decline in activity. At the time of test they are thawed and sections are cut at 20–30 μ on a freezing microtome. Four to twelve such sections are then incubated at 37° C in 6–8 ml of buffered substrate for periods of 15 to 60 min, at the end of which time phosphate analyses of filtered supernatant solution are carried out by Fiske and Subbarow's method. Duplicate sections are stained for

studies, but have preferred 0.162 molar buffer for quantitative microchemical analysis. We have reason to believe this preserves cellular integrity to a greater extent. We have used 0.0022 molar lead acetate in the incubating solution to precipitate the hydrolyzed phosphate for cytochemical localization; in this case the sections are not fixed on slides until after complete conversion of the precipitate to lead sulfide has been obtained. The only

[a] Obtained from Eastman Kodak Company.

counterstain used for the latter was a 2% solution of fast green in 70% alcohol, after fixation. All quantitative microchemical enzyme studies have made use of control preparations inhibited with 0.01 molar sodium fluoride, whose free phosphate content is subtracted from that of the test preparations. The net milligrams of phosphate hydrolyzed per hour has been divided by the milligrams of total tissue nitrogen in the sections separated from supernatant by centrifugation, as determined by the micro-Kjeldahl method of Wong. All our results are expressed in terms of this quotient (Qap), which usually reflects a nitrogen content of 0.1–0.4 mg.

Preliminary studies indicate a broad optimum pH range between 4.0 and 6.0, in which enzyme activity is roughly constant; the reaction increases with time of incubation and concentration of substrate, and does not seem markedly changed by small variations in concentration of the buffer. Heat denaturation at 100° C totally abolishes the reaction. We have worked with rather low substrate concentrations and short incubation periods (15–30 min) in the cytochemical preparations to preserve the nuclear localization of lead sulfide. The initial precipitate may become diffuse within or without the cell if the cells are damaged with heat or fixatives, or if incubation is prolonged.

The nuclei of all cells except prostatic epithelium and neurones react first in stained preparations, acquiring a dense brown precipitate of lead sulfide by the time a few scattered granules of precipitate appear in the cytoplasm. Staining appears selectively to demonstrate epithelium of all types before a reaction becomes marked in supporting muscular and connective tissue elements. The columnar duct epithelium of the breast, endometrium, epidermis, mucosa of the respiratory tract, and gastrointestinal tract all display a characteristic rapid response with gross staining possible after 15–30 minutes' incubation. We have noted even greater response in specimens of thyroid, parathyroid chief cell adenoma, pheochromocytoma, and ovarian corpora lutea. Quantitative analyses of the content of enzyme in the gastrointestinal tract confirm the staining technic in revealing a fivefold increase of enzyme in mucosa as compared with homologous smooth muscle (Table 1). Prostatic tissue, however, usually has a quotient of unity or above.

Gomori observed unusually heavy staining reaction in a number of cancers (*3*), and our studies to date, which include carcinomata of the breast, lung, skin, bladder, and all portions of the gastrointestinal tract, have shown a characteristic increase in acid phosphomonoesterase activity in the tumors when compared with their tissue of origin (Table 1). Analyses of different portions of the same gastrointestinal cancer have indicated that the ratio of phosphatase activity of the tumor specimen to that of the homologous muscle-free mucosa in the control is directly proportional to the percentage of neoplastic cells in each of the former specimens.

There is a considerable variation in the proportion of neoplastic cells in the tumor samples in Table 1. In those tests utilizing glandular epithelium free of muscle, the best control yet devised, the histological preparations must indicate nearly 100% viable neoplastic cells. If this condition is satisfied, then a mean twofold increase in enzyme activity has been demonstrated in all tests thus far. Certain histologically benign colonic polyps, which could be regarded as definitely premalignant by reason of close association with polyposis coli and adenocarcinoma, showed a fourfold increase in acid phosphatase. In contrast, we have thus far been unable to find any phosphatase increase in uterine leiomyomata, due possibly to the presence of large amounts of relatively nonreactive fibrous tissue in these benign tumors. Although Greenstein has noted similar increased acid phosphatase activity in rat and mouse hepatomas compared with regenerating and normal liver, no significant increase was reported for other transplantable malignant mouse tumors (*4*). Huggins and others have noted a marked reduction in the acid phosphatase of neoplastic human prostatic tissue compared with that of the normal adult gland (*5*). Since normal prostatic epithelium contains very large amounts of cytoplasmic acid phosphatase which it also secretes, it seems likely that the loss of activity noted was largely the result of anaplastic changes affecting specialized secretory mechanisms in the cytoplasm. To the best of our knowledge, increase in tissue acid phosphatase activity has not been previously reported in human neoplasms, and we believe our observations are of significance in providing a further indication of fundamental enzymatic disturbance in human cancerous tissue. It may be that the increased acid phosphomonoesterase activity of human cancer cells is related to the rapid uptake and retention of labeled phosphorus by malignant tissue (*6*), and it has been shown that the nuclei of malignant cells are more active than the cytoplasm in this respect unlike normal cells (*7*). The predominant nuclear location of the enzyme in cancers of organs other than the prostate probably prevents its escape to the blood stream with the same facility as is seen in carcinoma of the latter gland. Only 2 to 19% of advanced cancers of other organs produce even slight elevations in the normal serum level of this enzyme (*9*).

Simple technics such as we have used may aid a more intensive investigation of the quantitative microchemical changes involved in the malignant transformation of epithelial tissues in primates.

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Book Reviews

Das Schrifttum der Bodenkultur. Wien, Austria: Hochschule für Bodenkultur. Jahrgang 1, Heft 1 (Mai 1948), 36 pp.; Heft 2 (Juli 1948), 48 pp.

The Hochschule für Bodenkultur, Austria's major institution for agricultural research and teaching, in Vienna, where the periodical reviewed is being compiled, has a history as long as most institutions of its kind in Europe and America. The Hochschule is fortunate in having as its chief librarian and documentalist Sigmund von Frauendorfer, well known for his long, successful service as library director of the International Institute of Agriculture in Rome. In that capacity he took full advantage of the unusual opportunity to increase and improve the cooperative bibliographical undertakings in agriculture, forestry, and the related sciences.

It is probably rather general among Austrian leaders today to look upon international cooperation as something more than a necessity imposed upon this small country, which is surrounded by a number of large and powerful neighbors. The current journal, *Phaidros* (issued by the Nationalbibliothek), for example, similarly conveys a genuine interest in bringing about intellectual as well as aesthetic and ethical agreement between various cultures. Even a general newspaper such as the *Neue Freie Presse* shows tendencies of this kind. It is certainly reassuring to see in these Austrian publications an undaunted spirit of responsibility and constructive criticism which accepts other values with dignity and share its own qualities generously.

Dr. Frauendorfer leads off with a good summary of the nature and purpose of documentation, giving special reference to agriculture and forestry. For many years he has emphasized the need for instruction in documentation methods, and we are not surprised to find it repeated. He states that excellent and thorough bibliographies are of little value unless the potential and expected users are actually benefited.

The second issue has, as its lead article, a discussion of the Austrian agricultural press since the end of World War II, followed by a detailed bibliography of the 68 journals mentioned. Dr. Frauendorfer suggests that there is room for planning in this area in order to avoid uneconomical duplication of effort where there may be two journals for hunting and two for the sawmill industry, besides special ones in the fields of forestry and lumber.

The same able and highly instructive manner of reporting and appraisal displayed in the leading articles is shown in the review section. This and the special review department for periodical publications may prove to be the most valuable part of the *Schrifttum der Bodenkultur*. The sovereign objectivity of the editor, which should assure this journal an important place in the international agricultural world, is seen in the discussion of the Hudson-Richens pamphlet, *The new genetics in the Soviet Union*.

The scope of the *Schrifttum der Bodenkultur* is comprehensive in its subject matter and cultural and language affiliations. It is to be hoped that the editor will receive effective assistance from within and without Austria in making the new journal fulfill his aspirations.

The international book exhibition, sponsored by the Hochschule für Bodenkultur during June 1948, reported in Heft 2 of the *Schrifttum*, pp. 45–46, presented good selections of recent publications from several countries. This should inspire Austrians and visitors from other countries to step forward and match the honest and sincere efforts of this little but important land.

ICKO IBEN

University of Illinois

Equazioni differenziali. F. Tricomi. (Ed.) Torino, Italy: G. Einaudi, 1948. Pp. 313. (Illustrated.) 2400 lire.

This textbook on advanced ordinary differential equations, mainly of linear type, contains the author's improvements of Bendixon's theorem on the shape of solutions, and also of a theorem by Sonin and Pólya on the conditions under which the maxima and minima of a solution of a second order linear differential equation form a steadily increasing or decreasing sequence. Great care was given to general theorems on the location of zeros of the solutions; theorems on the zeros of Bessel functions are derived from much more general ones in a very simple manner.

The study of the boundary value problems of the Sturm-Liouville type is based on an ingenious and quite elementary transformation of Prüfer which reduces the problem to a single differential equation of first order. The author discusses the behavior of the characteristic values as the differential equation changes as well as relations to integral equations. A chapter on the so-called asymptotic methods includes a brief outline of the Laguerre and Legendre polynomials and illustrates numerically how good the asymptotic approximations under appropriate conditions are. A chapter on differential equations for complex variable includes the customary topics and also methods of solution through divergent series. The book has pronounced traits of originality in the choice of topics and particularly in its manner of presentation. The latter may be exemplified by the introduction of the elliptic functions of Jacobi as an application of a classical theorem on the existence of solutions of differential equations. The clarity of exposition, good printing and appropriate drawings make this book pleasantly readable.

I. OPATOWSKI

The University of Chicago

Association Affairs

The Gordon Research Conferences, sponsored by the AAAS and formerly known as the Gibson Island Research Conferences, will be held this year from June 20 to September 2 at the Colby Junior College, New London, New Hampshire, 100 miles from Boston and 130 miles from Springfield, Massachusetts. These Conferences were established to stimulate research in universities, research foundations, and industrial laboratories. Meetings are informal, with plenty of time for informal discussions as well as scheduled lectures. They are held morning and evening Mondays through Thursdays, and on Friday mornings. Afternoons are available for recreation, reading, resting, or participation in discussion groups. This type of meeting is a valuable means of disseminating information and bringing together scientists in related fields.

The purpose of the program is not to review the known fields of chemistry but primarily to report and explore underlying theories and profitable methods of approach for making new progress. In order to protect individual rights and to promote discussion, it is an established rule of each conference that all information presented is not to be used without specific authorization of the individual making the contribution, whether in formal presentation or in discussion. No publications are prepared as emanating from the conferences.

Individuals interested in attending the conferences are requested to send in their applications to the director on or before *April 1*. Each applicant must state the institution or company with which he is connected and the type of work in which he is most interested. Attendance at each conference is limited to 100.

The director will submit the names of those requesting attendance to the conference committee for each conference. The committee will review the names and select the members in an effort to distribute the requests as widely as possible among the various institutions and companies represented. Those accepted will be notified at least five weeks prior to the date of the conference and will receive registration cards. Advance registration by mail for each conference is required. Return of the registration card with a deposit of $25.00, made payable to the Gordon Research Conferences, AAAS, completes registration. The deposit of $25.00 covers $10.00 registration fee and $15.00 credit against subsistence expenses at the college. Rates for room and meals have not yet been established but it is planned to reduce the $9.50 daily rate charged last year. Members attending a conference are expected to live at the college but if special circumstances warrant their living elsewhere they will be charged $1.00 per day toward support of the conferences. The special reduction of seventy-five cents a day to members attending at their own expense has been discontinued.

If it is necessary to cancel a reservation, notice should be sent to arrive in the office of the director three weeks prior to the conference, whereupon $20.00 will be refunded from the $25.00 deposit. No refund will be made for later cancellation.

Accommodations are available for a limited number of women to attend the conference and for wives who wish to accompany their husbands. All such requests should be made at the time of request for attendance, because these limited accommodations will be assigned in the order that specific requests are received.

Requests for attendance at the conferences, or for any additional information, should be addressed to W. George Parks, Director, Department of Chemistry, Rhode Island State College, Kingston, Rhode Island. From June 15 to September 1, 1949, mail should be addressed to Colby Junior College, New London, New Hampshire.

Program

Petroleum

John R. Bowman, Chairman; C. C. Price, Vice Chairman

June 20 Beveridge J. Mair, James W. Westhaver, F. D. Rossini, "Theory and Practice of Fractionation of Liquids by Adsorption"; B. H. Sage, "Hydrocarbon Thermodynamics."

June 21 F. J. McClure, "Fundamental Aspects of Modern Combustion Research"; Manson Benedict, "Use of Entropy in Chemical Engineering."

June 22 C. F. Prutton, "Petroleum Lubricant Additives"; P. Debye, "Theory and Phenomena of Micelle Formation."

June 23 M. W. Tamele, Otto Beeck, "The Nature of the Silica-Alumina Cracking Catalyst"; P. D. Foote, "Civilization's Future Energy Needs."

June 24 A. G. Oblad, T. H. Milliken, G. A. Mills, "The Active Principle of Petroleum Cracking Catalysts."

Catalysis

Ahlborn Wheeler, Chairman; C. W. Montgomery, Vice Chairman

June 27 Discussion. H. S. Taylor, "The Recent Work of G. M. Schwab on the Activity of Alloy Catalysts"; John R. Bowman and Richard H. Wilhelm, "Theory and Practice in Fluid Bed Catalysis."

June 28 Pierce W. Selwood, "A New Technique: Nuclear Induction and the Structure of Catalytically Active Solids"; L. Hofer, "Thermo-Magnetic Analysis of Fischer-Tropsch Catalysts"; Otto Beeck, "Mechanism of (a) Isomerization and (b) Fischer-Tropsch Reactions from Experiments with Radio-Carbon and Heavy Hydrogen."

June 29 J. T. Kummer and P. H. Emmett, "Use of Isotopic Tracers in Chemisorption of Carbon Monoxide and Hydrogen on Iron Catalysts"; Henry H. Storch,

"Progress Report on Process Development in Fischer-Tropsch Reaction at the U. S. Bureau of Mines"; Speaker to be announced, "The Fischer-Tropsch Reaction in Fluid Beds."

June 30 Symposium on Catalyst Selectivity. Ahlborn Wheeler, "Introduction: The Influence of Reaction Kinetics and Pore Structure on Catalyst Selectivity"; John Turkevich, "Correlation of Selectivity with the Structure of the Catalyst Surface"; K. K. Kearby and Robert P. Sieg, "Selectivity and Reaction Mechanism in the Dehydrogenation of Butanes and Butylenes."

July 1 L. N. Leum, "Factors Affecting Selectivity, Activity and Life in Catalytic Cracking"; A. G. Oblad, "Structure and Activity of Oxide Type Catalysts—A New Concept."

Ion Exchange

W. C. Bauman, Chairman; Robert Kunin, Vice Chairman

July 4 W. C. Bauman, "Cation Exchange Resins"; R. Kunin, "Anion Exchange Resins."

July 5 W. P. Kelley, J. S. Joffe, "Inorganic Exchange Materials, Relation to Soils"; G. E. Boyd, E. R. Tompkins, "Ion Exchange in the Inorganic Field."

July 6 M. Calvin, B. N. Dickinson, H. G. Cassidy, "Ion Exchange in the Organic Field"; L. Hammett, "Ion Exchange Resins as Catalysts."

July 7 H. P. Gregor, L. E. Davis, "Static Equilibria in Ion Exchange Resins"; E. J. Roberts and H. Bliss, "Kinetics in Batch and Continuous Operation."

July 8 G. P. Monet, W. Juda, "Ion Exchange as Unit Process—Economies."

Polymers

R. M. Fuoss, Chairman; H. M. Spurlin, Vice Chairman

July 11 H. F. Mark, "Polymerization and Polymer Properties in the Solid State"; P. J. Flory, "Molecular Configuration and Intrinsic Viscosity of Polymers."

July 12 B. H. Zimm, "Light Scattering and the Structure of Polymers"; R. S. Spencer, "Rheological Properties of Polymers."

July 13 M. S. Matheson, "Absolute Rate Constants in Free Radical Polymerizations"; K. Nozaki, "Long-Lived Free Radicals in Polymerization Reactions"; G. E. Hulse, "Redox Emulsion Polymerization Systems"; J. M. Swanson, "Physical Characterization of Cellulose Xanthate in Solution."

July 14 C. T. Walling and F. R. Mayo, "Copolymerization by Non-Radical Mechanisms"; R. G. Heiligmann, "Friedel-Crafts Catalyzed Polymerization at Low Temperatures"; S. G. Cohen, "Some Reactions of Alkyl Percarbonates"; C. D. West, " Some Molecular Interactions with Polar Polymers."

July 15 C. A. Winkler, "Experiments on Diffusion of High Polymers."

Textiles

J. H. Dillon, Chairman; Earl E. Berkley, Vice Chairman

July 18 H. Mark, "Principles for the Selection of Fiber-Forming Materials"; R. C. Houtz, " 'Orlon' Acrylic Fiber: Chemistry and Properties."

July 19 Milton Harris, "The Nature of the Felting Phenomenon and Some Anti-Felt Treatments"; E. L. Skau, "A Calorimetric Investigation of the Cellulose-Water Relationships in Textile Fibers."

July 20 William Utermohlen, "Detergency Studies"; T. E. Morton, "Dyeing of Cellulose Considered as a Diffusion Process."

July 21 J. W. Rowen, "Some Infrared Studies on Cellulosic Compounds"; Joseph Brant, "Discussion of Crease-Resistant Treatments of Fine Cotton Fabrics."

July 22 Robert Hoffman, "Relationship of Fiber Properties to Fabric Properties."

Corrosion

H. R. Copson, Chairman; W. S. Loose, Vice Chairman

July 25 H. H. Uhlig, "Theoretical Considerations Pertinent to Localized Corrosion"; Norman Hackerman, "Effect of Condition of the Metal Surface on Localized Corrosion."

July 26 F. L. LaQue, "Pitting in Sea Water and Brines"; W. Lynes, "Impingement Attack."

July 27 E. P. Partridge, "Pitting in Boiler Waters and Fresh Waters"; A. Wachter, "Effects of Inhibitors on Localized Corrosion."

July 28 A. Brenner, "Pitting Through Coatings"; R. B. Mears, "Granular, Transgranular, and Intergranular Corrosion."

July 29 F. W. Fink, "Techniques for Studying Localized Corrosion."

Instrumentation

H. C. Frost, Chairman; V. F. Hanson, Vice Chairman

August 1 Physical Methods for Chemical Analysis. Speaker to be announced, "Review of Recent Advances in Absorption and Emission Spectroscopy"; D. D. Friel, "Recent Improvements of Baird Infrared Gas Analyzer"; Willard H. Bennett, "Radio-Frequency Mass Spectrometer"; William Parrish, "X-ray Powder Diffraction Analysis; Geiger Counter and Film Techniques."

August 2 Measurements of Physical Properties of Materials. Shirleigh Silverman, "Transient Gas Temperature Measurements"; Frank T. Gucker, Jr., "Photoelectric Methods of Determining Size and other Properties of Aerosol Particles"; John W. Forrest, "New Developments in Optical Instruments."

August 3 Symposium on Special Instruments. This session will consist of a series of short contributions by members of the Conference. Its purpose will be to describe the application of important instruments that have been found useful for special studies but which are not known by the average laboratory worker. While it is not intended to publish the program for this session in advance, some of the subjects to be presented include: (1) Non-dispersive Ultraviolet Gas Analyzer. (2) Discussion of New Electric Circuits for Chemical Investigations. (3) Guard Circuit Bridge with Oscillograph Detector for Resistance and Capacity Measurements in the Range of 100 Cycles to 300 Kilocycles. (4) A.C. Operated Micro Micro-ammeter with Built-in Regulated

Power Supply Suitable for Recording or Indicating Phototube or Ion Chamber Currents. (5) High Sensitivity Recording Electronic Potentiometer.

August 4 Electronic Instruments and Elements for Research. J. P. Arndt, Jr., "Piezoelectricity Applied to Instrumentation"; Allen B. du Mont, "Use of Cathode-Ray Oscilloscopes in Chemical and Physical Research"; Joseph F. Lash, "A Contact Modulated Amplifier and Some of Its Laboratory Uses."

August 5 Application of Industrial-Type Instruments to Research. Speakers for this session will be announced at a later date.

Vitamins and Metabolism

Esmond E. Snell, Chairman; E. L. R. Stokstad, Vice-Chairman

August 8 C. A. Baumann, "Biological Value of Certain Carotinoids"; Paul D. Boyer, "Structure and Properties of Tocopherols in Relation to Biological Function"; Roger J. Williams, "Individual Metabolic Patterns and Their Significance in Nutrition and Disease"; C. Woodruff and W. J. Darby, "The Relation of Vitamin C and Folic Acid to Tyrosine Metabolism."

August 9 Gladys Emerson and T. R. Wood, "Some Aspects of Vitamin B_{12}"; H. B. Woodruff, "Microbiological Response to Vitamin B_{12} and Substances of Related Physiological Activity"; L. D. Wright, "Microbiological Studies with Vitamin B_{12}." Discussion: William Shive. George K. Davis, "The Minor Elements, Cobalt, Copper and Molybdenum in Animal Nutrition."

August 10 George W. Kidder, Virginia C. Dewey and R. E. Parkes, Jr., "The Use of Tetrahymena in Vitamin and Metabolism Studies." Discussion: E. L. R. Stokstad. G. Fraenkel, "Insects in Vitamin Research with Special Reference to New B-Factors"; Henry Lardy, "Metabolic Functions of Biotin." Discussion: Robert E. Eakin.

August 11 William Shive, "Metabolite Antagonists and Vitamin Function"; Herschel K. Mitchell, "Neurospora Metabolism and Vitamins"; H. E. Carter, "Inositol Lipids"; I. C. Gunsalus, "Nature and Function of an Unidentified Factor Required for Pyruvate Oxidation."

August 12 John R. Murlin, "The Criteria of Biological Values Among Food Proteins." Discussion: D. V. Frost. J. B. Thiersch and F. W. Phillips, "Effect of Folic Acid Antagonists on Mammals in Reference to their Action on Neoplastic Disease."

Food and Nutrition

Daniel Melnick, Chairman; James B. Allison, Vice-Chairman

August 15 Food Acceptance. Frank R. Goetzl, "Studies on Human Appetite"; John R. Brobeck, "The Role of the Nervous System in Regulating Food Intake." Discussion: Richard H. Barnes. Theodore F. Zucker, "Appetite Depressants with Particular Reference to Gossypol"; Aaron M. Altschul, "Chemical and Physiological Investigations of Gossypol." Discussion: Edward Eagle.

August 16 Adjustment to Malnutrition. Harold H. Mitchell, "Studies with Animals"; Herbert Pollack, "Studies with Humans." Discussion: Norman Jolliffe. Henry L. Taylor, "Starvation"; Speaker to be announced, "Obesity." Discussion: L. Emmett Holt, Jr.

August 17 The Pros and Cons of Proteolysis in Food Processing and Storage. William F. Geddes, "The Milling and Baking Industry"; Orville G. Hankins, "The Meat Packing Industry." Discussion: Daniel Melnick. Newer Techniques and Controls in Preservation of Foods. Charles R. Stumbo, "Agitation of Foods during Thermal Processing"; Bernard E. Proctor, "Irradiation Procedures." Discussion: John M. Jackson.

August 18 Chromatographic Techniques. Richard J. Block, "Amino Acid Analyses"; Speaker to be announced, "Carbohydrate Analyses." Discussion. The Nutritional Implications of Vitamins with Modified Solubility Characteristics. Aaron Arnold, "Water-insoluble Forms of the Water-soluble Vitamins"; Albert E. Sobel, "Water-dispersible Forms of the Water-insoluble Vitamins." Discussion: Saul H. Rubin.

August 19 Physiological Availability of the Amino Acids. Carl N. Lyman, "Availability for Absorption"; Ernest Geiger, "The Importance of the Time Element in Supplementation." Discussion: Robert A. Harte.

Medicinal Chemistry

R. C. Batterman, Chairman; Marlin T. Leffler, Vice-Chairman

August 22 Antihistaminics. Arthur W. Weston, "Chemistry of Antihistaminics"; Earl R. Loew, "Pharmacology and Mechanisms of Action of Antihistaminics"; Frederick Brown, "The Clinical Use of Antihistaminics in the Respiratory Allergies"; Walter C. Lobitz, Jr., "The Value of Antihistaminics to the Dermatologist."

August 23 Enzymes. Arthur Kornberg, "Enzymatic Synthesis of Dinucleotides"; Thomas P. Singer, "The Action of Riboflavin Analogues on Isolated Enzymes." Macrocytic Anemia. Karl Folkers (Tentative), "Vitamin B_{12}"; A. L. Franklin, "Nutritional Aspects of Animal Protein Factor"; Arnold D. Welch, "Present Status of Folic Acid and Vitamin B_{12}."

August 24 Chemotherapy. H. M. Crooks, Jr., "Chemistry of Chloromycetin"; Lawrence B. Hobson, "Recent Developments in Chemotherapy." Viruses. S. E. Luria, "Virus Multiplication"; Randall L. Thompson, "The Effect of Metabolite Antagonists on the Growth of Mammalian Viruses."

August 25 Rheumatoid Arthritis. Charles Ragen, "Chemistry of Rheumatoid Arthritis"; Edward F. Rosenberg, "Rheumatoid Arthritis, Present-day Aspects of Its Pathogenesis and Therapy." Diuretics. Robert A. Lehman, "Pharmacology of Mercurial Diuretics"; Robert C. Batterman, "The Clinical Evalution of Mercurial Diuretics in the Treatment of Congestive Heart Failure."

August 26 Anticoagulants. C. F. Huebner, "Chemistry of Dicumarol and Related Compounds"; M. L. Wolfrom, "The Chemistry of Heparin and Related Types of Anti-

coagulants''; Speaker to be announced, ''The Clinical Use of Anticoagulants.''

CANCER

W. H. Summerson, Chairman; W. U. Gardner, Vice-Chairman

August 29 O. Warburg and A. L. Lehniger, ''Cancer and Fermentation Enzymes''; G. A. LePage, ''Studies of Glycolytic Enzymes of Tumors''; J. Greenstein, ''Proteolytic Enzymes and Cancer''; D. M. Greenberg, ''Effect of Amino Acid Analogs on Protein Formation: Relation to Cancer.''

August 30 E. S. Guzman Barron, ''Mechanism of Action of Ionizing Radiations''; E. Lorenz, ''Some Biological Effects of Ionizing Radiations on Laboratory Animals''; G. O. Gey, ''Evidences of Biologic Variation in Tissue Cultured Strains of Normal and Malignant Cells''; W. Earle, ''Certain Recent Advances in Tissue Culture in Relation to Cancer Research.''

August 31 G. H. Twombly and E. F. Schoenewaldt, ''Metabolism of Estrogenic Hormones Labeled with Radioactive Isotopes''; C. R. Moore, ''Role of Hormones in the Differentiation and Determination of Tissues''; A. Cantarow and K. E. Paschkis, ''Certain Aspects of Hormone Imbalance in Experimental Carcinogenesis''; R. K. Boutwell, ''Studies on the Rate of Tumor Formation and the Activity of the Adrenal Cortex.''

September 1 F. S. Philips and J. B. Thiersch, ''Effects of 4-Amino Pteroylglutamic Acid and Congeners in Mammals''; E. B. Schoenbach, ''Status and Potentialities of Folic Acid Antagonists as Carcinolytic Agents''; S. Farber, ''Action of Folic Acid Conjugates and Antagonists on Leukemia and other Forms of Disseminated Cancer.''

September 2 J. G. Kidd and H. M. Toolan, ''Studies on the Mechanisms of Resistance and Immunity to Transplanted Cancer Cells''; J. J. Bittner, R. A. Huseby, and C. P. Barnum, Jr., ''Studies on the Factors Associated with the Development of Mammary Cancer in Mice.''

NEWS and Notes

W. C. Fernelius, chairman of the Department of Chemistry at Syracuse University, has been appointed professor and head of the Department at Penn State College, State College, Pennsylvania.

Francis E. Ray, formerly of the Laboratory of Radiochemistry, University of Cincinnati, has been appointed director of the University of Florida Cancer Research Laboratory, effective July 1.

B. I. Burns, administrator of hospitals at the University of Texas Medical Branch, Galveston, has accepted appointment as director of Municipal Hospitals for Kansas City, Missouri, effective in March.

Charles E. Lankford, formerly associate professor in Bacteriology at the University of Texas Medical School, Galveston, has been appointed associate professor in bacteriology at the main university in Austin.

Sven Hedin, 83-year old Swedish explorer and scientist who was partially blinded during an exploring expedition into Asia 55 years ago, has regained the sight of one eye through a recent operation by K. G. Ploman, Swedish eye specialist.

William G. McDaniel, chemical engineer, has joined the Operations Branch, Plants Division, Technical Command, Army Chemical Center, Maryland.

Alice Eastwood, botanist at the California Academy of Sciences since 1892 and curator of the Department of Botany since 1896, retired on January 19 on the occasion of her ninetieth birthday. At the January meeting of the Academy Council, Miss Eastwood was made curator emeritus of botany. **John Thomas Howell** was named curator, and **Elizabeth McClintock,** assistant curator.

Abel Wolman, of Johns Hopkins University, has been appointed lecturer and research consultant in Sanitary Engineering at the University of Illinois.

Margaret Fuller Boos, consultant geologist in Denver, is serving as visiting professor in the University of Illinois' Department of Geology during the spring semester.

Jaroslav Dedek, chemical engineer and former director of the research station for the sugar industry in Czechoslovakia, has taken up temporary residence in Belgium. He is interested in coming to the United States to establish an international society of beet sugar technology. Persons wishing to communicate with him may address him in care of Robert C. Hockett, 52 Wall Street, New York City 5.

Thomas K. Sherwood, dean of engineering at Massachusetts Institute of Technology, and **Bruce S. Old,** of the Arthur D. Little staff, have been elected to the Board of Directors of Arthur D. Little, Inc., Cambridge, Massachusetts.

Hyman I. Goldstein, of Camden, New Jersey, has been elected an honorary member of the Belgian Gastroenterological Society, and a corresponding member of the Cuban Society of Cancerology.

The appointment of **Harold H. Berman** as director of Willowbrook State School, Staten Island, New York City, was recently announced. Dr. Berman was formerly on the medical staff at St. Lawrence State Hospital, Ogdensburg.

Walter P. Taylor, wildlife research supervisor, U. S. Fish and Wildlife Service, and leader of the Oklahoma Cooperative Wildlife Research Unit, has been elected honorary Life Fellow of the Texas Academy of Science.

John B. Calkin, of New York City, has been appointed director of the Department of Industrial Cooperation, and associate professor of chemical engineering at the University of Maine. **Lyle Jenness,** who has been

cting director of the Department will ecome head of the Department of hemical Engineering.

E. D. Merrill, Arnold professor meritus of Botany, Harvard Univerity, has been appointed president of he Taxonomic Section of the Seventh nternational Botanical Congress, hich is to convene in Stockholm the mmer of 1950.

Harry Eagle has resigned as scienfic director of the Research Branch of he National Cancer Institute, to head new Section on Experimental Therapeutics in the Microbiological Institute, National Institutes of Health, ethesda, Maryland.

Daniel Melnick, formerly chief of he Food Development Division, uartermaster Food and Container Institute for the Armed Forces, has been ppointed chief technologist at The est Foods, Inc., Bayonne, New Jerey.

Paulis P. Bijlaard, Arthur J. McNair, and **Floyd O. Slate** have been ppointed associate professors in the chool of Civil Engineering at Cornell niversity.

Grants and Awards

The Robert Gould Research Foundation, Cincinnati, has made a grant-in-aid of $4,000 for research in nutrition to C. A. Elvehjem, dean of the raduate School and chairman of the Biochemistry Department, University f Wisconsin. Dr. Elvehjem will study he use of amino acids as the sole ource of protein in the diet.

On fellowships granted by the **Westinghouse Educational Foundation,** 50 secondary school teachers will eceive a six-week refresher course in cience at the Massachusetts Institute f Technology this summer. A total rant of $62,500 will make it possible or 50 teachers to receive grants of 250 each summer for the next five ears.

The University of Cincinnati has eceived a $2,500 fellowship from the rosley Broadcasting Corporation to tudy the relationship between educaion and television.

The University of Buffalo Medical chool will receive $432,000 from the estate of Mrs. S. Margaret Berrick Meyer for a new research laboratory in memory of her husband. It will be known as the Edward J. Meyer Laboratory.

The Charles Hayden Foundation of Boston has created a $100,000 endowment fund at Columbia University, the income from which will be used to enable students from New York City and Boston to attend Columbia College. Since 1939, the Foundation has provided scholarship funds for more than 250 students.

The American Psychological Association has received a grant of $3,000 from the Carnegie Corporation of New York toward support of an analysis of the state of progress in each of the principal areas of psychological research.

The Photographic Society of Sweden has awarded the Adelsköld Gold Medal to C. E. K. Mees, vice president in charge of research for the Eastman Kodak Company, for his contributions to the progress of photography. Dr. Mees acknowledged the award from Rochester, New York, in a shortwave broadcast beamed to Sweden and other European countries.

The James Watt Medal of the Institution of Mechanical Engineers in London has been awarded Fredrik Ljungström, Swedish inventor, who designed the rotary air preheater.

The Kungliga Fysiografiska Sällskapet in Lund, Sweden, recently awarded its silver medal to William Randolph Taylor, University of Michigan, in recognition of his research in marine algae.

Peter J. W. Debye, of Cornell University, will receive the 1949 **Willard Gibbs Medal** at the meeting of the Chicago Section of the American Chemical Society on May 20.

The University of Southern California's Department of Chemistry has begun two new research projects, sponsored by the Office of Naval Research. Investigation of surface areas and structure of proteins will be under the supervision of Sydney W. Benson, and a study of the properties of ionic solutions at the critical temperature of the solvent under the joint supervision of Dr. Benson and Charles S. Copeland.

Richard L. Potter has been granted a postdoctorate research fellowship by the Atomic Energy commission to work with David Green in the new **Enzyme Institute** at the University of Wisconsin. The purpose of the fellowship is to provide advanced research training in the physical, biological, and medical sciences related to atomic energy. Dr. Potter will use radioactive tracers in his work on the synthesis of enzymes.

Edgar Reynolds Smith, chief of the Physical Chemistry Section, National Bureau of Standards, has been awarded the 1949 **Hillebrand prize** of the Washington Section, American Chemical Society. Dr. Smith, who prepared the first samples of heavy water, was cited particularly for his contributions to electrochemistry and ebulliometry.

Under the 1949–50 **Shell Fellowship Program,** 44 fellowships in chemistry, geology, geophysics, physics, and related fields have been established at 36 colleges and universities throughout the country. Each fellowship provides tuition and fees as well as payment of $1,200 to the student and $300 to the department of study for his expenses.

Fellowships

Butler University, Indianapolis, Indiana, announces that two new Holcomb Research Fellowships are now available to graduate students in chemistry. The fellowships are valued at $1,500 per year and are tenable for two years. Applications may be addressed to the Department of Chemistry.

The New York Zoological Society offers summer research fellowships providing $500 for three months, June 15 through September 15, to advanced research workers who hold a Ph.D. degree in physiology, zoology, biology, ecology, psychology, or a related field and who have special interest and experience in the study of animal behavior. Further information may be obtained by writing to the New York Zoological Society, **Behavior Research Program,** Bronx Zoo, New York 60, N. Y. The Society is also offering limited grants-in-aid for participation in the **third**

summer research program at the Jackson Hole Wildlife Park, Moran, Wyoming. Qualified graduate students and professionally established persons who wish to conduct research in ecology, conservation and land use, wildlife, life history studies, behavior, botany, ornithology, entomology, pathology and parasitology, and aquatic biology are invited to apply to program committee members: J. R. Simon, Moran, Wyoming, chairman; C. R. Carpenter, Pennsylvania State College; W. W. Chase, University of Michigan.

Colleges and Universities

An expedition from the **Instituto Lillo of Tacumán University,** Argentina, has been exploring the Tierra del Fuego-South Patagonia region for the past two months to study its zoological and geographical relationship to surrounding island groups, and to Australia and New Zealand. The expedition is headed by Claes Christian Olrog, young Swedish zoologist.

Six colleges are participating in "Project Squid," a fundamental reseach program on jet propulsion sponsored by the Office of Naval Research. Headquarters for the project are at **Princeton University.** Cooperating institutions are **New York University, Purdue University, Cornell Aeronautical Laboratory, Brooklyn Polytechnic Institute,** and the **University of Delaware.** The project will include a year's work on "Heat Transfer in Passages with Free Convection and Counter Flow," directed by S. A. Guerrieri, of the University of Delaware, with the assistance of Robert Connell and Charles V. Foster.

The University of Wisconsin has begun construction on the first $2,500,000 wing of its engineering building, the beginning of an $82,000,000 10-year building project.

The Woman's Medical College, Philadelphia, Pennsylvania has announced the following appointments to its faculty: Edward H. Vick, clinical assistant in pediatrics; William Ellis and S. Micelli, clinical assistants in urology; Harry B. Adams, Jr., clinical assistant in proctology; Mary Helen Cameron, fellow in radiology; Marian Abbott Boyd, clinical instructor in medicine; Alice M. Anderson, Frances A. Harkins, Mildred R. Mitchell, clinical assistants in medicine.

Meetings and Elections

The Texas Academy of Science elected the following officers at its December meeting in San Antonio, Texas: president, J. Brian Eby; vice president, C. M. Pomerat; editor, J. L. Baughman; president of the Conservation Council, J. G. Sinclair; secretary-treasurer, Gladys H. Baird. The theme of the meeting was "Conservation of Natural Resources and of Population." A quarterly publication, *Texas Journal of Science,* will be initiated by the Academy next month. The Collegiate and Junior Academies have a membership approaching that of the Senior Academy and each puts on a full program of its own.

The Biological Photographic Association's New York Chapter has elected Percy Brooks, head of the medical Illustration Department of Cornell University Medical School, chairman of its acting executive committee. Margaret Smith Frankow, of the Department of Dermatology, Columbia University, was elected secretary-treasurer of the group.

The Washington Academy of Sciences elected the following officers at its January meeting: president, Frank H. H. Roberts, Jr.; president-elect, Francis B. Silsbee; secretary, Frank M. Setzler; treasurer, Howard S. Rappleye; elected to the Board of Managers, William F. Foshag and C. Lewis Gazin.

The British Association for the Advancement of Science will hold its annual meeting at Newcastle-upon-Tyne, August 31–September 7. Preliminary programs will be available in early May, upon application to the secretary, David M. Lowe, BAAS, Burlington House, London W1.

The World Engineering Conference will hold its second International Technical Congress in Cairo, March 20–26. Three U. S. engineers who will present papers at the Congress are: W. H. Carson, dean of the School of Engineering, University of Oklahoma; Morris L. Cooke, Philadelphia management engineer and government consultant; and James S. Thompson, vice chairman of the board, McGraw-Hill Book Company. Max Thornburg of the Engineers Joint Council Middle East Commission has also been invited to attend as a Council delegate.

The Anthracite Conference, sponsored by the Anthracite Institute and Lehigh University, Pennsylvania, will be held at the University May 5–6. A. Copeland Callen, head of Lehigh's department of mining engineering, is chairman of the committee planning the sessions.

The International Union of Biological Sciences will hold a conference on "Development, Growth and Regeneration of the Nervous System" at the University of Chicago, March 21–25, under the chairmanship of Paul Weiss. Foreign scientists participating are J. Boeke, Utrecht; Holger Hyden, Stockholm; Rita Levi-Montalcini, Torino; Albert Stefanelli, Rome; Sydney Sunderland, Melbourne; and J. Z. Young, London.

The annual conference of the **British Textile Institute** will be held in Dublin, Ireland, May 24–27. Walter J. Hamburger, director of Fabric Research Laboratories, Inc., Boston, Massachusetts, will present a paper on "Industrial Applications of Stress-Strain Relationships."

The Midwest Power Conference, sponsored by the Illinois Institute of Technology, will be held at the Sherman Hotel, Chicago, April 18–20. Invitations are extended to those interested in the nation's power problems. Programs may be obtained from the conference secretary, Edwin R. Whitehead, Illinois Institute of Technology, 3300 Federal Street, Chicago 16.

The American Physical Society's Division of Solid State Physics will hold a symposium in Cleveland, March 10–12. The program will include the following invited papers to be presented on Thursday afternoon and Friday morning and afternoon:

George E. Pake, Washington University, "Nuclear Magnetic Resonance in Studies of Solids"; E. Guth, University of Notre Dame (title to be announced); Charles Kittel, Bell Telephone Laboratory, "Recent Develop-

ments in Ferromagnetism''; F. S. Goucher, Bell Telephone Laboratory, "Photoelectric Effects in PN Rectifying Barriers''; R. Smoluchowski, Carnegie Institute of Technology, "Recent Developments in Order-Disorder Phenomena''; E. Orowan, Cambridge, England, "Brittle Fracture of Triaxial Stresses''; F. Seitz, C. I. T., "The Multiplication of Electrons in Crystals by High Electrostatic Field''; I. Esterman, C.I.T., "Resistivity of Germanium Samples at Liquid Helium Temperatures''; J. E. Goldman, Westinghouse Research Laboratories, "Influence of Atomic Order on Magnetic Properties''; Cyril S. Smith, University of Chicago, "Grain and Interphase Boundaries in Metals''; A. W. Lawson, University of Chicago, "New Techniques in High Pressure Research.''

In addition, regular sessions of papers concerning the solid state will be held on Friday and Saturday.

Unesco News

A Unesco Mission arrived in the Philippines early last month to study problems of civic information and education and to help in developing a program of adult and primary education. Floyd Reeves, specialist in educational administration on leave from the University of Chicago, will direct the work of the Mission, assisted by Paul Hanna, of Stanford University, and Dean Cliff A. Lewis, Ontario College of Education, Toronto. The Philippine Government will meet part of the expenses of the mission, which will last about three months. This is the second contract of its kind concluded by Unesco with a member state. The first calls for a similar mission to Afghanistan.

The *Unesco Courier,* a monthly newspaper which is published in Paris and which reports global activities of the Organization, will soon be available to U. S. readers on a subscription basis. Orders may be placed with the Columbia University Press, New York City 27.

Deaths

Ladislaw Farkas, 44, professor of physical chemistry at Hebrew University, Jerusalem, died December 31 in an airplane crash while en route to the U. S. He was well known among physical chemists for his research in reaction kinetics and photochemistry, and especially for his fundamental investigations of the orthohydrogen-parahydrogen conversion.

Townes Randolph Leigh, 68, dean emeritus of the College of Arts and Sciences and head of the Chemistry Department of the University of Florida, died in Gainesville on February 15. Appointed acting vice president of the Unversity in 1934, Dr. Leigh became vice president in 1946 and, in 1948, was given the title of honorary vice president.

Bailey Willis, 91, professor emeritus of geology at Stanford University, and former president of the Seismological Society of America, died in Palo Alto, California February 19. From 1884 to 1916, Dr. Willis had served with the U. S. Geological Survey. The second volume of his autobiography is in process of publication.

W. A. Anderson, 49, curator of the Phanerogamic Herbarium and associate professor of botany at the State University of Iowa, died February 20.

Russell W. Porter, 77, artist-astronomer who made the detailed sketches of the 200-inch Palomar telescope, died in Pasadena, California February 22. Dr. Porter accompanied Admiral Peary to the Arctic, and joined several other expeditions to Greenland, Baffin Land and Franz Josef Land.

Keith L. Maurer, 53, electrical engineer with the Bell Telephone Laboratories, died February 25 at his home in Rockville Centre, New York.

W. J. Conway, professor of chemistry at Fordham University, died February 28 in Teaneck, New Jersey.

The Lepidopterists' Society is now sponsoring or preparing to initiate cooperative projects on phenology and butterfly migration and on a systematic-biological monograph of Nearctic butterflies. The society was formed in 1947 for the purpose of maintaining close contacts between all persons, in all nations, interested in any aspects of the study of Lepidoptera. It now publishes a monthly periodical, *The Lepidopterists' News,* which contains reviews of biological and taxonomic subjects, abstracts of recent papers on Lepidoptera from the world literature, and short communications from members. Research papers are excluded. The only condition for membership is payment of dues, which are $2.00 for 1949. Each member receives a subscription to *The Lepidopterists' News.* Remittances may be sent to the editor, C. L. Remington, Osborn Zoological Laboratory, Yale Station, New Haven, Connecticut.

A method for the quantitative determination of phenol and cresol in complex biochemical samples by counter-current distribution has been developed by Army investigators at Camp Frederick, Maryland. The counter-current distribution method, the basis of which is the partition of a soluble substance between two mutually immiscible phases, has been used in antibiotic and antimalarial investigations, but has had only limited use in the field of analytical chemistry. The new application of the method is described in a report, "The Determination of Phenol and Cresol in Complex Biochemical Mixtures'' (PB 95891), which can be obtained from the Photoduplication Service, Library of Congress, Washington 25, D. C. The price is $3.75 for photostat and $2.00 for microfilm. Orders should be accompanied by check or money order payable to the Librarian of Congress.

Publication of "Pharmacological Reviews," a supplement to be included with the last issue of each of the three annual volumes of the *Journal of Pharmacology and Experimental Therapeutics,* will begin with the *Journal's* April issue. About 160 pages will be devoted to each issue of the supplement, which will be edited by Louis Goodman, with the assistance of J. H. Comroe, C. A. Dragsted, H. A. Eagle, A. McG. Harvey, O. Krayer, C. C. Pfeiffer, and M. L. Tainter. The first issue will contain articles on the anticholinesterases, drug-protein

interactions, ganglionic blocking agents, adrenergic blocking agents, and salicylates. The supplements may be ordered from the *Journal* separately at the rate of $2.00 each, in advance, or by increasing the payment for the *Journal* subscription from $15.00 to $18.00 per year.

The National Research Council of Canada is extending its wartime research on snow problems related to the operation of tracked vehicles to cover the general problem of snow mechanics. The Dominion spends at least $20,000,000 every year in snow removal. Transport over snow also presents special difficulties and provision must be made for the pressure exerted by ice against dams. Problems like these are under study by the Research Council's Associate Committee on Soil and Snow Mechanics, which sponsored a recent survey of snow centers in the western U. S. and Canada by Marcel de Quervain, Swiss snow scientist on loan to Canada, and D. C. Pearce.

Motion pictures made with X-rays are being produced at the University of Washington Medical School with apparatus designed by Robert F. Rushmer, assistant professor of physiology. The subject is placed against a fluoroscope screen, which glows when struck by X-rays, and thus produces an image. Because X-rays would fog the camera film, the lens of the movie camera is faced away from the screen and the image is projected to the lens by a series of mirrors. The camera is protected by a lead shield. A speedy technique for processing the film makes it possible to show the movies the same day they are taken. Dr. Rushmer is working on a way to synchronize the X-ray current with the camera shutter so as to minimize the subject's exposure. The Seattle Orthopedic Hospital is using the X-ray movies to study the heart in action.

A study of Peruvian culture, part of Cornell University's broad program of cultural anthropology, was started last month under the direction of Allan Holmberg in Callejon de Huaylas, a mountain valley along the north coast of Peru. This region is undergoing a transition to modern industrialization and Dr. Holmberg will analyze the human and social problems involved. The Institute of Ethnology of the University of San Marcos is collaborating with him in the work. The Peruvian study is conducted in coordination with the other projects of the Cornell program, which is supported by the Carnegie Corporation. Alexander Leighton has been working with American Indians in the Southwest and Lauriston Sharp has been in Siam since last summer. M. E. Opler plans a research trip to India this fall.

The University of Illinois' College of Dentistry plans to offer a course of six round table discussions on **"Current Advances in Dentistry"** this fall, to be transmitted by telephone from coast to coast. Telephone connections from Chicago are made by ordinary toll call to the various cities and loud speakers amplify the speeches in local meeting rooms. Lantern slides, brochures, and other material are furnished to the participating groups. The University's telephone extension courses were begun two years ago by Saul Levy, chairman of the program.

Recently Received—

The Cavendish Laboratory, by Sir Lawrence Bragg. (19th Autumn lecture to The Institute of Metals, delivered 16 September 1948.) Published by the Institute, 4 Grosvenor Gardens, London, S.W.1, England.

The First World Health Assembly, by James A. Doull and Morton Kramer. (Reprint No. 2894 from the Public Health Reports.) Washington 25, D. C.: Supt. of Documents, U. S. Government Printing Office. $.10.

Intellectual abilities in the adolescent period: their growth and development, by David Segel. (Federal Security Agency Bull. 1948.) Washington 25, D. C.: Supt. of Documents, U. S. Government Printing Office. $.15.

Bulletin Scientifique de l'Association des Ingénieurs Electriciens Sortis de l'Institut Électrotechnique Montefiore, January 1949, No. 1. Siege Social, Rue Saint-Gilles, 31, Liège, Belgium. 50 fr.

Education in Panama (Bull. 1948, No. 12) and Education in Venezuela (Bull. 1948, No. 14) by Delia Goetz. Office of Education, Federal Security Agency bulletins. Washington 25, D. C.: Supt. of Documents, U. S. Government Printing Office. $.25 and $.30, respectively.

Report of Activities, April 1945–March 1948, and Summaries of Research prepared by the Board for Scientific and Industrial Research, Government of Palestine. Copies obtainable from the B.S.I.R., P.O. Box 607, Jerusalem at 3/.

Annual Reports for 1945–47 (Nos. 58–60) of the Marine Biological Station at Port Erin, Isle of Man, prepared by J. H. Orton. Liverpool, England: University Press. 5/.

British Marine Gas Turbines (the 13th Parsons Memorial Lecture) by T. W. F. Brown. North-East Coast Institution of Engineers and Shipbuilders, Bolbec Hall, Newcastle upon Tyne, England.

Make Plans for—

14th North American Wild Life Conference, March 7–9, Statler Hotel, Washington, D. C.

American Chemical Society, 115th national meeting, March 28–April 1, San Francisco, California.

American College of Physicians, 30th annual session, March 28–April 1, New York City.

American Orthopsychiatric Association, annual meeting, April 4–7, Stevens Hotel, Chicago.

Erratum: **The International and Fourth American Congress on Obstetrics and Gynecology** is scheduled to take place May 14–19, 1950 in New York City rather than in 1949 as originally reported in *Science*, (February 25, pg. 217).